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Energy Research Abstracts

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Office of Scientific and Technical Information
UNITED STATES DEPARTMENT OF ENERGY

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UNITED STATES DEPARTMENT OF ENERGY
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Energy Research Abstracts

Coverage

Energy Research Abstracts (ERA) provides abstracting and indexing coverage of all scientific and technical reports and patent applications originated by the U.S. Department of Energy, its laboratories, energy centers, and contractors, as well as theses and conference papers and proceedings issued by these organizations in report form. Audiovisual materials, computer media (magnetic tapes, diskettes, etc.), and engineering drawings are included in this definition. *ERA* also covers other energy information prepared *in report form* by federal and state government organizations, foreign governments, and domestic and foreign universities and research organizations, *provided* that the full text of the document has been received by OSTI. Foreign report information is obtained through the International Energy Agency's 16-nation Energy Technology Data Exchange, the International Atomic Energy Agency's International Nuclear Information System, or nation-to-nation agreements. The purpose of this publication is to announce documents produced or obtained by DOE that are not so readily available as journal articles, books, or patents.

Scope

The scope of *ERA* encompasses DOE's research, development, demonstration, and technology programs resulting from its broad charter for energy sources, supplies, safety, environmental impacts, and regulation.

The citations presented in *ERA* are available for online searching as records within the Energy Science and Technology Database (EDB). The current-year records are available on the Integrated Technical Information System (ITIS).

Availability

DOE and DOE contractors can obtain *ERA* (regular issues and annual indexes) by using VISA, MasterCard, or OSTI deposit accounts. Contact the Office of Scientific and Technical Information, P.O. Box 62, Oak Ridge, TN 37831, Attention: Information Services. For further information, call (615)576-8401. *ERA* is also available at authorized GPO Depository Libraries. (List is provided on the inside back cover.)

ERA (regular issues and annual indexes) is available to the public on a subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Managing Editor, Leota S. Kane
Technical Editor, Barry C. Steele

Information Sources

The citations presented in *Energy Research Abstracts* are a subset of the worldwide energy information provided to the Office of Scientific and Technical Information (OSTI) through exchange agreements with foreign sources and through exchanges or contracts with U.S. organizations.

The **Energy Technology Data Exchange (ETDE)** was established by the International Energy Agency to promote cooperation among members in conducting appropriate energy-related research and development programs through the development of a formal central information sharing system. In accomplishing the objectives of the ETDE, members select, abstract, and index relevant research information published in their countries in accordance with Exchange standards. OSTI serves as the central receiving and processing center for this information, which it then disseminates to national centers in the participating countries. The following countries are currently members of the ETDE:

Canada	Poland
Denmark	Republic of Korea
Finland	Spain
France	Sweden
Germany	Switzerland
Italy	The Netherlands
Japan	United Kingdom
Norway	United States

The **International Nuclear Information System (INIS)** was established to promote the exchange of information on nuclear science and technology. Its operation is similar to that of the ETDE, with the INIS Secretariat being located in Vienna, Austria. Currently, 79 countries and 15 international organizations are members of INIS. OSTI serves as the INIS national center for the United States.

In the exercise of its rights and responsibilities under the agreements to which it is a party, the **Office of Scientific and Technical Information** both receives information from the above sources and submits U.S.-produced information to them. In addition to materials generated by the Department of Energy, this U.S.-produced information is gathered from other government agencies as well as under contract with private information processing companies. All input is computer processed and entered into a database for online retrieval. The database serves as well for the production of numerous OSTI publications.

How To Read A Citation

The principal data elements included in these citations are:

1. **Abstract number** within volume.
2. **Report number** identification for report-type literature.
3. **Title and subtitle** (non-English title may appear in parentheses, if applicable).
4. **Author(s).** First 10 names in the data record are printed, then "et al." is listed.
5. **Author affiliation.** Only first one is listed, in parentheses after author(s) to which it applies.
6. **Collaboration,** if present.
7. **Corporate author(s)** identifying corporation responsible for document.
8. **Date of publication.** If not known, a processing date is in brackets.
9. **Number of pages** or page range. Prices are based on total pages unless special pricing applies.
10. **Language** of document if non-English.
11. **Monograph title** if citation is an analytic (part, chapter, or paper) of a larger monograph.
12. **Sponsoring organization.**
13. **Contract or grant number.**
14. **Secondary identifying number;** may be a conference number.
15. **Conference title, location, and date,** if applicable.
16. **Order number.** The "DE" order number may be used for ordering from NTIS or OSTI, as appropriate. The "TI" prefix is valid only at OSTI.
17. **Sources of availability** from which a copy of the document may be obtained; usually appear as abbreviations. (See information on following page.)
18. **Drop note** or explanatory statement.
19. **Abstract.**
20. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18494 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in $30m^2$ air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Order from the Availability Sources

TO OBTAIN A REPORT

Report literature, usually identified by an alphanumeric identifier at the beginning of a citation, is available from the sources listed in the citation (see example of element 2 on page iii). Often the sources are listed as abbreviations. Corresponding addresses are provided at right from which documents with these abbreviations may be ordered. When "OSTI" is given, **DOE and DOE contractors may order these documents from OSTI.** (However, check with your library or information organization which may require that orders go through them to OSTI.) OSTI prices are based on total pages unless special pricing applies. The public should order from NTIS or from one of the other agencies listed in the citation. NTIS price codes may continue to appear in some records. To expedite processing, an order form is provided in the back of this publication. NOTE: The order numbers provide quicker access for report ordering. Use the order number where possible.

GPO Superintendent of Documents
Government Printing Office
Washington, DC 20402

GPO Dep. Available for inspection or interlibrary loan at Government Printing Office regional depository libraries.

INIS *Available only in microfiche.*
INIS Clearinghouse
International Atomic Energy Agency
P.O. Box 100, A-1400
Vienna, Austria

NTIS U.S. Department of Commerce
Technology Administration
National Technical Information Service
Springfield, VA 22161

OSTI U.S. Department of Energy
Office of Scientific and Technical Information
P.O. Box 62
Oak Ridge, TN 37831

ESTSC Energy Science and Technology Software Center
P.O. Box 1020
Oak Ridge, TN 37831-1020

CASI Attention: Document Order
NASA Center for AeroSpace Information
800 Elkridge Landing Road
Linthicum Heights, MD 21090-2934

How To Use the Indexes

Five indexes are provided for approaching the content of each issue of *Energy Research Abstracts*. Descriptions of entries in these indexes follow.

Corporate Author Index
The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index
Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Subject Index
This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES
See also DEUTERIUM
HYDROGEN 4
TRITIUM
Neutron-Rich Isotopes
Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index
DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 **Wisconsin Univ., Madison (USA). Dept. of Physics**
15:18494 DOE/ER/40438–T1
FG02-88ER60664 **Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)**

Report Number Index
Technical report literature is indexed by the alphanumerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is:

DOE/ER/40438–T1	15:18494	NTIS, OSTI	E 1.99: DE89007246	MF-411

Subject Contents

The subject content of *Energy Research Abstracts* is arranged as shown below. The two-digit and four-digit category numbers printed here illustrate the category number assignment used in the database records.* The following list includes all of the 38 first-level and the 313 second-level categories. Because each issue of *ERA* publishes citations only for those documents announced during the past semimonthly period, some subject categories may not be present in every issue.

Numerical Listing of Categories

01 COAL LIGNITE, AND PEAT
- 03 Preparation
- 04 Processing
- 05 Products and By-Products
- 06 Properties and Composition
- 08 Waste Management
- 09 Environmental Aspects
- 10 Reserves, Geology, and Exploration
- 20 Mining
- 30 Transport, Handling, and Storage
- 40 Combustion
- 50 Economic, Industrial, and Business Aspects
- 60 Health and Safety
- 70 Legislation and Regulations

02 PETROLEUM
- 02 Reserves, Geology, and Exploration
- 03 Drilling and Production
- 04 Processing
- 05 Products and By-Products
- 06 Health and Safety
- 07 Economic, Industrial, and Business Aspects
- 08 Waste Management
- 09 Environmental Aspects
- 10 Legislation and Regulations
- 20 Transport, Handling, and Storage
- 30 Properties and Composition
- 50 Combustion

03 NATURAL GAS
- 02 Reserves, Geology, and Exploration
- 03 Drilling, Production, and Processing
- 04 Products and By-Products
- 05 Health and Safety
- 06 Economic, Industrial, and Business Aspects
- 07 Waste Management
- 08 Environmental Aspects
- 10 Legislation and Regulations
- 20 Transport, Handling, and Storage
- 30 Properties and Composition
- 40 Combustion

04 OIL SHALES AND TAR SANDS
- 02 Reserves, Geology, and Exploration
- 03 Drilling, Fracturing, and Mining
- 04 Oil Production, Recovery, and Refining
- 05 Properties and Composition
- 06 Products and By-Products
- 07 Health and Safety
- 08 Economic, Industrial, and Business Aspects
- 09 Waste Management
- 10 Environmental Aspects
- 20 Legislation and Regulations
- 30 Transport, Handling, and Storage
- 40 Combustion

05 NUCLEAR FUELS
- 01 Reserves, Exploration, and Mining
- 04 Feed Processing
- 05 Uranium Enrichment
- 07 Fuels Production and Properties
- 08 Spent Fuels Reprocessing
- 09 Transport, Handling, and Storage
- 10 Economic, Industrial, and Business Aspects
- 20 Waste Management
- 30 Environmental Aspects
- 40 Health and Safety
- 50 Safeguards, Inspection, and Accountability
- 60 Legislation and Regulations

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
- 01 Physical Isotope Separation
- 02 Radiation Sources
- 03 Isotopic Power Supplies
- 04 Economic, Industrial, and Business Aspects
- 05 Health and Safety
- 06 Environmental Aspects
- 07 Regulation and Licensing

08 HYDROGEN
- 01 Production
- 02 Storage, Transport, and Handling
- 04 Economic, Industrial, and Business Aspects
- 05 Health and Safety
- 07 Products and By-Products
- 08 Properties and Composition
- 09 Environmental Aspects
- 10 Waste Management
- 20 Legislation and Regulations
- 30 Combustion

09 BIOMASS FUELS
- 07 Resources
- 08 Production
- 09 Processing
- 10 Properties and Composition
- 20 Combustion
- 30 Economic, Industrial, and Business Aspects
- 40 Transport, Handling, and Storage
- 50 Environmental Aspects
- 60 Health and Safety
- 70 Legislation and Regulations
- 80 Waste Management
- 90 Products and By-Products

*The numerical subject category scheme is used in the storage, retrieval, and manipulation of bibliographic information entered into DOE's data systems. Categories and definitions for the complete set of six-digit numbers are given in ETDE/PUB--1-R2, *International Energy: Subject Categories and Scope.*

10 SYNTHETIC FUELS
- 02 Production
- 03 Properties and Composition
- 04 Combustion
- 05 Transport, Handling, and Storage
- 06 Health and Safety
- 07 Economic, Industrial, and Business Aspects
- 08 Waste Management
- 09 Environmental Aspects
- 10 Legislation and Regulations
- 20 Products and By-Products

13 HYDRO ENERGY
- 01 Resources and Availability
- 02 Site Geology and Meteorology
- 03 Plant Design and Operation
- 04 Legislation and Regulations
- 05 Economic, Industrial, and Business Aspects
- 06 Environmental Aspects
- 07 Power-Conversion Systems
- 08 Health and Safety

14 SOLAR ENERGY
- 01 Resources and Availability
- 03 Economic, Industrial, and Business Aspects
- 04 Environmental Aspects
- 05 Solar Energy Conversion
- 06 Photovoltaic Power Systems
- 07 Solar Thermal Power Systems
- 08 Ocean Energy Systems
- 09 Solar Thermal Utilization
- 10 Solar Collectors and Concentrators
- 20 Heat Storage
- 30 Health and Safety
- 40 Legislation and Regulations

15 GEOTHERMAL ENERGY
- 01 Resources and Availability
- 02 Geology and Hydrology of Geothermal Systems
- 03 Geothermal Exploration and Exploration Technology
- 04 Legislation and Regulations
- 05 Economic, Industrial, and Business Aspects
- 06 Environmental Aspects
- 07 Products and By-Products
- 08 Geothermal Power Plants
- 09 Geothermal Engineering
- 10 Direct Energy Utilization
- 20 Geothermal Data and Theory
- 30 Health and Safety
- 40 Waste Management

16 TIDAL AND WAVE POWER
- 01 Resources and Availability
- 03 Legislation and Regulations
- 04 Economic, Industrial, and Business Aspects
- 05 Environmental Aspects
- 07 Tidal Power Plants
- 08 Wave Energy Converters
- 09 Health and Safety

17 WIND ENERGY
- 01 Resources and Availability (Climatology)
- 03 Legislation and Regulations
- 04 Economic, Industrial, and Business Aspects
- 05 Environmental Aspects
- 06 Wind Energy Engineering
- 07 Health and Safety

20 FOSSIL-FUELED POWER PLANTS
- 01 Power Plants and Power Generation
- 02 Waste Management
- 04 Health and Safety
- 05 Environmental Aspects
- 06 Economic, Industrial, and Business Aspects
- 07 Legislation and Regulations

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS
- 01 Power Reactors, Nonbreeding, Light-Water Moderated, Boiling Water Cooled
- 02 Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled
- 03 Power Reactors, Nonbreeding, Graphite Moderated
- 04 Power Reactors, Nonbreeding, Otherwise Moderated or Unmoderated
- 05 Power Reactors, Breeding
- 06 Power Reactors, Mobile, Propulsion, Package, and Transportable
- 07 Regulation and Licensing
- 08 Economics
- 09 Process Heat Reactors

22 NUCLEAR REACTOR TECHNOLOGY
- 01 Theory and Calculation
- 02 Components and Accessories
- 03 Fuel Elements
- 04 Control Systems
- 05 Environmental Aspects
- 06 Research, Test, Training, Production, Irradiation, Materials Testing Reactors
- 09 Reactor Safety

24 POWER TRANSMISSION AND DISTRIBUTION
- 01 Power Systems
- 02 Power System Networks, Transmission and Distribution
- 03 Power Transmission Lines and Cables
- 04 Health and Safety
- 05 Environmental Aspects
- 06 Legislation and Regulations
- 04 Economic, Industrial, and Business Aspects

25 ENERGY STORAGE
- 01 Magnetic
- 02 Compressed and Liquefied Gas
- 04 Capacitor Banks
- 05 Flywheels
- 06 Thermal
- 08 Chemical
- 09 Batteries
- 10 Economic, Industrial, and Business Aspects
- 20 Health and Safety
- 30 Environmental Aspects
- 40 Legislation and Regulations

29 ENERGY PLANNING AND POLICY
- 01 Energy Analysis and Modeling
- 02 Economics and Sociology
- 03 Environment, Health, and Safety
- 04 Energy Resources
- 05 Research, Development, Demonstration, and Commercialization
- 06 Nuclear Energy
- 07 Transport and Storage

08 Heat Utilization
10 Conservation
20 Supply, Demand, and Forecasting
30 Policy, Legislation, and Regulation
40 Fossil Fuels
50 Hydrogen and Synthetic Fuels
60 Electric Power
80 Consumption and Utilization
90 Unconventional Sources and Power Generation

30 DIRECT ENERGY CONVERSION
01 MHD Generators
02 EHD Generators
03 Thermoelectric Generators
04 Thermionic Converters
05 Fuel Cells
08 Miscellaneous Converters

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
01 Buildings
02 Transportation
03 Industrial and Agricultural Processes
06 Municipalities and Community Systems
09 Education and Public Relations

33 ADVANCED PROPULSION SYSTEMS
01 Internal Combustion Engines
02 External Combustion Engines
03 Electric-Powered Systems
04 Hybrid Systems
05 Flywheel Propulsion
06 Vehicle Design Factors
07 Emission Control
08 Alternative Fuels

35 ARMS CONTROL
01 Policy, Negotiations, and Legislation
02 Proliferation
03 Verification

36 MATERIALS
01 Metals and Alloys
02 Ceramics, Cermets, and Refractories
06 Other Materials

40 CHEMISTRY
01 Analytical and Separations Chemistry
02 Inorganic, Organic, and Physical Chemistry
04 Electrochemistry
05 Photochemistry
06 Radiation Chemistry
07 Radiochemistry and Nuclear Chemistry
08 Combustion, Pyrolysis, and High-Temperature Chemistry

42 ENGINEERING
02 Facilities, Equipment, and Techniques
04 Heat Transfer and Fluid Flow
05 Materials Testing
10 Combustion Systems
20 Mining and Underground Engineering
30 Marine Engineering
50 Power Cycles
60 Components, Electron Devices and Circuits
70 Nuclear Explosions

43 PARTICLE ACCELERATORS
01 Design, Development, and Operation
02 Beam Dynamics, Field Calculations, and Ion Optics
03 Auxiliaries and Components
04 Storage Rings

44 INSTRUMENTATION
01 Radiation Instrumentation
02 Radiation Effects on Instrument Components, Instruments, or Electronic Systems
04 Well Logging Instrumentation
05 Thermal Instrumentation
06 Optical Instrumentation
07 Geophysical and Meteorological Instrumentation
08 Miscellaneous Instrumentation

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE
01 Chemical Explosions and Explosives
02 Nuclear Explosions and Explosives
03 Nuclear Explosion Detection
04 Nuclear and Radiological Warfare
05 Strategic Defense Initiative
06 Chemical and Biological

54 ENVIRONMENTAL SCIENCES
01 Environmental Sciences, Atmospheric
02 Environmental Sciences, Terrestrial
03 Environmental Sciences, Aquatic

55 BIOMEDICAL SCIENCES, BASIC STUDIES
01 Behavioral Biology
02 Biochemistry
03 Cytology
04 Genetics
05 Metabolism
06 Medicine
07 Microbiology
08 Morphology
09 Pathology
10 Physiological Systems
20 Public Health
30 Agriculture and Food Technology

56 BIOMEDICAL SCIENCES, APPLIED STUDIES
01 Radiation Effects
02 Thermal Effects
03 Chemicals Metabolism and Toxicology
04 Other Environmental Pollutant Effects

57 HEALTH AND SAFETY
01 Real Accidents

58 GEOSCIENCES

66 PHYSICS
10 General Physics
11 Classical and Quantum Mechanics
12 Techniques of General Use in Physics
12-10 Cryogenics
12-20 Particle Beam Production and Handling; Targets
13 Other Aspects of Physical Science
20 Physics of Elementary Particles and Fields
21 General Theory of Particles and Fields
22 Specific Theories and Interaction Models; Particle Systematics
23 Specific Interactions, Decays and Processes

24 Properties of Specific Particles and Resonances
30 Nuclear Physics
31 Nuclear Structure
32 Radioactivity and Electromagnetic Transitions (Excluding Fission)
33 Nuclear Reactions and Scattering, General
34 Specific Nuclear Reactions and Scattering
35 Nuclear Mass Ranges
36 Radiation Physics
40 Atomic and Molecular Physics
41 Theory of Electronic Structure of Atoms and Molecules
42 Spectra of Atoms and Molecules and Their Interactions with Photons
43 Collision Phenomena
44 Experimentally Derived Information on Atomic and Molecular Properties
45 Special Atoms and Molecules
50 Physics of Condensed Matter
51 Nuclear Techniques in Condensed Matter Physics
52 Solid-State Plasma
53 Interactions Between Beams and Condensed Matter
54 Quantum Physics Aspects of Condensed Matter
54-10 Superconductivity
54-20 Superfluidity
54-30 Other Topics in Quantum Fluids and Solids
55 Direct Energy Conversion

70 PLASMA PHYSICS AND FUSION
03 Plasma Physics and Fusion Research
04 Fusion Technology

99 GENERAL AND MISCELLANEOUS
01 Management
02 Mathematics and Computers
03 Information Handling
04 Law

CORPORATE AUTHOR INDEX

PERSONAL AUTHOR INDEX

SUBJECT INDEX

CONTRACT NUMBER INDEX

REPORT NUMBER INDEX

ORDER NUMBER CORRELATION

Alphabetical Listing of Categories

33 ADVANCED PROPULSION SYSTEMS
35 ARMS CONTROL
09 BIOMASS FUELS
56 BIOMEDICAL SCIENCES, APPLIED STUDIES
55 BIOMEDICAL SCIENCES, BASIC STUDIES
40 CHEMISTRY
01 COAL, LIGNITE, AND PEAT
30 DIRECT ENERGY CONVERSION
32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION
29 ENERGY PLANNING AND POLICY
25 ENERGY STORAGE
42 ENGINEERING
54 ENVIRONMENTAL SCIENCES
20 FOSSIL-FUELED POWER PLANTS
99 GENERAL AND MISCELLANEOUS
58 GEOSCIENCES
15 GEOTHERMAL ENERGY
57 HEALTH AND SAFETY
13 HYDRO ENERGY
08 HYDROGEN
44 INSTRUMENTATION
07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY
36 MATERIALS
45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE
03 NATURAL GAS
05 NUCLEAR FUELS
21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS
22 NUCLEAR POWER TECHNOLOGY
04 OIL SHALES AND TAR SANDS
43 PARTICLE ACCELERATORS
02 PETROLEUM
66 PHYSICS
70 PLASMA PHYSICS AND FUSION
24 POWER TRANSMISSION AND DISTRIBUTION
14 SOLAR ENERGY
10 SYNTHETIC FUELS
16 TIDAL AND WAVE POWER
17 WIND ENERGY

Energy Research Abstracts

01 COAL, LIGNITE, AND PEAT

Refer also to citation(s) 927

0103 Preparation

Refer also to citation(s) 20, 35, 53

1 (DOE/PC/90311–14) **Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fourteenth quarterly report, 14 November 1993–13 February 1994.** Miller, J.D. Utah Univ., Salt Lake City, UT (United States). 10 Aug 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90311. Order Number DE95002430. Source: OSTI; NTIS; GPO Dep.

During this quarter of the DOE project, "Characterization of Multiphase Fluid Flow During Air-Sparged Hydrocyclone Flotation", efforts were made to correlate the x-ray CT measurements with the flotation experiments reported in the last. quarterly report. In this regard the axial view of the flow regimes in the ASH during steady state operation were constructed from the radial density profiles as revealed by x-ray CT measurements. By studying the characteristics of the flow regimes from these axial views and relating them with flotation recovery data, a more detailed understanding of ASH flotation was possible. Construction of the axial view of the flow regimes and the effect of two operating variables, dimensionless area ratio (A* = overflow opening area/underflow opening area) and percent solids in the feed, are reported in this quarterly report.

2 (DOE/PC/90311–15) **Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fifteenth quarterly report, 14 February 1994–13 May 1994.** Miller, J.D. Utah Univ., Salt Lake City, UT (United States). 10 Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90311. Order Number DE95002431. Source: OSTI; NTIS; GPO Dep.

During this quarter of the DOE project, "Characterization of Multiphase Fluid Flow During Air-Sparged Hydrocyclone Flotation", the x-ray CT measurements were correlated with the results from the flotation experiments reported in the 13th quarterly report. In this regard the axial view of the flow regimes in the ASH during steady state operation were constructed from the radial density profiles as revealed by x-ray CT measurements. Construction of the axial view of the flow regimes was explained in the last quarterly report. By studying the characteristics of the flow regimes from these axial views and relating them with flotation recovery data, a phenomenological description of ASH flotation was possible. The effect of two operating variables, inlet pressure and dimensionless flow rate ratio (A* = air flow rate/slurry flow rate), are reported in this quarterly report.

3 (DOE/PC/91043–T12) **An investigation of the role of water on retrograde/condensation reactions and enhanced liquefaction yields: Quarterly progress report, July 1, 1994–September 30, 1994.** Netzel, D.A.; Miknis, F.P. Western Research Inst., Laramie, WY (United States). Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91043. Order Number DE95002633. Source: OSTI; NTIS; GPO Dep.

Different methods for coal drying are being investigated to determine if drying can be accomplished without destroying coal reactivity toward liquefaction, thereby making coal drying a relatively economical and efficient method for coal pretreatment. Coal drying methods include conventional thermal drying, microwave drying, and chemical drying at low temperature. State-of-the-art solid-state nuclear magnetic resonance (NMR) technique of cross polarization with magic-angle spinning (CP/MAS) is being employed (1) to measure changes in coal structure brought about by the different methods of drying and by low temperature oxidation and (2) to measure the changes in the aromatic hydrogen-to-carbon ratio of the solid material formed during coal liquefaction. The overall objectives of this work are to conduct research that will provide the basis for an improved liquefaction process, and to facilitate our understanding of those processes that occur when coals are initially dissolved. Changes in coal structure that may occur during coal drying will be measured in order to determine the effects of coal drying on its reactivity toward liquefaction. The objectives for this quarterly report period were (1) to complete coal liquefaction experiments on the microwave and chemically dried coals, (2) to analyze the product gases, liquids, and residues, and (3) to determine the percent conversion of the dried coals.

4 (DOE/PC/92206–T5) **Bench scale testing of micronized magnetite beneficiation: Quarterly technical progress report, January–March 1994.** Anast, K. AMAX Research and Development Center, Golden, CO (United States). 25 Jul 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92206. Order Number DE95002422. Source: OSTI; NTIS; GPO Dep.

The goal of the bench scale testing program is to offer the industry an excellent facility for development of promising processes/equipment which have been tested on laboratory scale. Continuous bench-scale testing is a prerequisite for design of larger scale process development or commercial demonstration units. The primary focus of the technology is on processing -28 mesh coal fines, usually a waste product of coal preparation-plants. This project is aimed at development of a process that can expand the application of heavy media by using ultra fine magnetite suspension. The technology to be evaluated is capable of making separations on coal finer than 28 mesh. These coal fines, produced during coal mining and crushing, are separated in conventional coal preparation plants and generally impounded in a tailings pond. Development of an economic process for processing these fines into marketable product will expand the utilization of coal for power production in an environmentally acceptable and economically viable way. Micronized magnetite beneficiation has been effectively researched at PETC but it has not been studied in a continuous bench-scale unit, which is a necessary step towards commercial development of this promising technology. Thus the primary goal of the proposed program is to investigate the technology in a continuous circuit, at a reasonable scale to provide a design basis for larger plants and a commercial feasibility study. Accomplishments for the quarter are presented for the following tasks: project and test planning; engineering and design; and installation and shakedown.

5 (DOE/PC/92246–T5) **Development of enhanced sulfur rejection processes: Final technical progress report: Seventh quarter, April 1, 1994–June 30, 1994.** Yoon, R.H.; Luttrell, G.; Adel, G.; Richardson, P.E. Virginia Center for Coal and Minerals Processing, Blacksburg, VA (United States). 29 Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92246. Order Number DE95002621. Source: OSTI; NTIS; GPO Dep.

Research at Virginia Tech led to the development of two complementary concepts for improving the removal of inorganic sulfur from many eastern US coals. These concepts are referred to as Electrochemically Enhanced Sulfur Rejection (EESR) and Polymer Enhanced Sulfur Rejection (PESR). The EESR process uses electrochemical techniques to suppress the formation of hydrophobic oxidation products believed to be responsible for the floatability of coal pyrite. The PESR process uses polymeric reagents that react with pyrite and convert floatable middlings, i.e., composite particles composed of pyrite with coal inclusions, into hydrophilic particles. These new pyritic-sulfur rejection processes do not require significant modifications to existing coal preparation facilities, thereby enhancing their adoptability by the coal industry. It is believed that these processes can be used simultaneously to maximize the

rejection of both well-liberated pyrite and composite coal-pyrite particles. The project was initiated on October 1, 1992, and a detailed work plan and work schedule (Task 1) were developed. During the current reporting period (April 1, 1994 to June 30, 1994), characterization of coal samples from Upper Freeport (subtask 2.1) and SEM-IPS analysis of feed samples of Illinois No. 6 and Pittsburgh No. 8 (subtask 2.2) were continued. In addition, an experimental design for research on the last phases of this research was developed, submitted to PETC's COR, and approved, as required in the work plan. This research will employ a 3/4-inch column flotation cell for testing of both the EESR (Task 5) and the PESR (Task 6) processes.

0104 Processing

Refer also to citation(s) 3, 55, 59, 63, 64, 71, 728, 731, 904, 1345, 1364

6 (CONF-9306148–49) **Desulfurization of hot fuel with Z-Sorb III sorbent.** Campbell, W.M.; O'Donnell, J.J.; Katta, S.; Grindley, T.; Delzer, G.; Khare, G. Kellogg (M.W.) Co., Houston, TX (United States). [1993]. 14p. Sponsored by USDOE, Washington, DC (United States). From Coal-fired power systems '93: advances in IGCC and PFBC review meeting; Morgantown, WV (United States); 28-30 Jun 1993. Order Number DE93000299. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to evaluate regenerable sorbents for potential use in desulfurization of integrated gasification combined cycle (IGCC) fuel gas in a fixed bed operating at temperatures of 900–1200°F (482–649°C) and pressures up to 300–400 psia (2068–2758 kPa). Important evaluation criteria are adequate sulfur absorption capacity, physical and chemical durability, and complete regenerability. The experimental tests were conducted at the Morgantown Energy Technology Center in their high pressure bench-scale hot gas desulfurization unit, which contains a 2 in (5.1 cm) ID reactor system. Like zinc ferrite and zinc titanate, Z-Sorb III is also a zinc oxide-based sorbent supported on a proprietary matrix designed to provide stability and prolong the sorbent life. The test program was divided into four phases. Phase I was essentially a screening or feasibility study and consisted of a relatively short series of complete sulfidation-regeneration cycles. Phase II was a longer term multi-cycle test designed to demonstrate durability and regenerability of the sorbent. Parametric tests of sulfidation variables were done in Phase III. The major variables investigated were gas velocity (0.5–2.0 fps) (0.15–0.61 mps) and absorption temperature (900–1100°F) (482–593°C). Work continued on regeneration techniques during this phase with the purpose of identifying the most cost-effective method for the commercial reactor. Phase IV of the test program was included to examine the effects, if any, of small quantities of HCl in the feed gas. A total of seven cycles were completed. The test program ended with a single sulfidation at the same conditions run during Phase I. This permitted a direct comparison of a relatively fresh sorbent with one that had been subjected to a wide variety of test conditions over an extended period of time.

7 (CONF-9406131–59) **Enviropower hot gas desulfurization pilot.** Ghazanfari, R.; Feher, G.; Konttinen, J.; Ghazanfari, R.; Lehtovaara, A.; Mojtahedi, W. Enviropower, Inc., Tampere (Finland). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). From Coal-fired power systems: advances in IGCC and PFBC review meeting; Morgantown, WV (United States); 21-23 Jun 1994. Order Number DE95002064. Source: OSTI; NTIS; GPO Dep.

The objectives of the project are to develop and demonstrate (1) hydrogen sulfide removal using regenerable zinc titanate sorbent in pressurized fluidized bed reactors, (2) recovery of the elemental sulfur from the tail-gas of the sorbent regenerator and (3) hot gas particulate removal system using ceramic candle filters. Results are presented on pilot plant design and testing and modeling efforts.

8 (DOE/EA–0870) **Scale-up of mild gasification to a process development unit.** USDOE Morgantown Energy Technology Center, WV (United States). Dec 1993. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002668. Source: OSTI; NTIS; GPO Dep.

Commercialization of mild gasification processes would help meet the National Energy Strategy goals of securing future energy supplies and enhancing US technology competitiveness by increasing utilization of the large domestic coal reserves. Mild gasification technologies would also retain markes for coal and open new markets. The purpose of this proposed action is to demonstrate a new mild gasification technology to convert non-metallurgical coal into beneficial and industry needed products in an environmentally acceptable manner, and to demonstrate good pollution prevention practices which would become very beneficial to the coke and steel industries.

9 (DOE/MC/24257–3796) **Integrated low emissions cleanup system for direct coal fueled turbines: Twenty-sixth quarterly report: Quarterly status for the period January–March 1994.** Newby, R.A.; Alvin, M.A.; Bachovchin, D.M.; Yang, W.C.; Smeltzer, E.E.; Lippert, T.E. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. 15 Apr 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC24257. Order Number DE95002464. Source: OSTI; NTIS; GPO Dep.

The United States Department of Energy, Morgantown Energy Research Center (DOE/METC), is sponsoring the development of direct coal-fired turbine power plants as part of their Heat Engines program. A major technical challenge remaining for the development of the direct coal-fired turbine is high-temperature combustion gas cleaning to meet environmental standards for sulfur oxides and particulate emissions, as well as to provide acceptable turbine life. The Westinghouse Electric Corporation, Science and Technology Center, is evaluating two Integrated Low Emissions Cleanup (ILEC) concepts that have been configured to meet this technical challenge: a baseline ceramic barrier filter ILEC concept, and a fluidized bed ILEC concept. These ILEC concepts simultaneously control sulfur, particulate, and alkali contaminants in the high-pressure combustion gases at turbine inlet temperatures up to 2300°F. This document reports the status of a program in the twenty-sixth quarter to develop this ILEC technology.

10 (DOE/MC/24257–3896) **Integrated low emissions cleanup system for direct coal fueled turbines (moving bed, fluid bed contactor/ceramic filter): Twenty-seventh quarterly status report, April–June 1994.** Newby, R.A.; Alvin, M.A.; Bachovchin, D.M.; Yang, W.C.; Smeltzer, E.E.; Lippert, T.E. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. [1994]. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-87MC24257. Order Number DE95001482. Source: OSTI; NTIS; GPO Dep.

The United States Department of Energy, Morgantown Energy Research Center (DOE/METC), is sponsoring the development of advanced, coal-fueled turbine power plants such as pressurized fluid bed combustion and coal gasification combined cycles. A major technical challenge remaining for the development of the coal-fueled turbine is high-temperature gas cleaning to meet environmental standards for sulfur oxides and particulate emissions, as well as to provide acceptable turbine life. The Westinghouse Electric Corporation, Science & Technology Center, is evaluating Integrated Low Emissions Cleanup (ILEC) concepts that have been configured to meet this technical challenge. These ILEC concepts simultaneously control sulfur, particulate, and alkali contaminants in the high-pressure process gases. This document reports the status of a program in the twenty-seventh quarter to develop this ILEC technology.

11 (DOE/MC/27391–3892) **Scale-up of mild gasification to a process development unit: Quarterly report, February–May, 1994.** Campbell, J.A.L.; Carty, R.H.; Foster, H. Kerr-McGee Coal Corp., Oklahoma City, OK (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC27391. Order Number DE95000016. Source: OSTI; NTIS; GPO Dep.

The overall objective of this project is to develop the IGT Mild-Gasification (MILDGAS) process for near-term commercialization. The specific objectives of the program are to: design, construct, and operate a 24-ton/day adiabatic process development unit (PDU) to obtain process performance data suitable for further design scaleup; obtain large batches of coal-derived co-products for

industrial evaluation; prepare a detailed design of a demonstration unit; and develop technical and economic plans for commercialization of the MILDGAS process. The MILDGAS process is a continuous closed system for producing liquid and solid (char) coproducts at mild operating conditions up to 50 psig and 1,300 F. It is capable of processing a wide range of both eastern caking and western noncaking coals. This quarter, the permit to construct was obtained from the state of Illinois EPA. A meeting was held at IGT on February 23, 1994 between IGT and Bechtel to discuss the revisions to the flowsheet and the new timetable for obtaining the revised bids. Bechtel Corp. was reactivated and flowsheet, reactor design details, and heat and material balances were revised. Bechtel Corp. prepared revised PFDs, PIDs, process specifications, and the data sheets for the gasifier for resubmittal to the bidders. The revised bid sheets were submitted to the bidders and the new bids have been received and are being analyzed.

12 (DOE/MC/27423–3874) **Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues.** Haas, J.C.; Wilson, K.B. Combustion Power Co., Inc., Menlo Park, CA (United States). Mar 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27423. Order Number DE94012298. Source: OSTI; NTIS; GPO Dep.

Combustion Power, under the auspices of the US Department of Energy, is developing a moving granular-bed filter for the control of particulate in gasification and pressurized fluidized bed environments. In Task 2, technical issues are identified which need to be resolved for the granular-bed filter to be commercially viable. The technical issues are ranked in relative importance.

13 (DOE/MC/27423–3875) **Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 3, Test plan.** Haas, J.C.; Purdhomme, J.W.; Wilson, K.B. Combustion Power Co., Inc., Menlo Park, CA (United States). Apr 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27423. Order Number DE94012299. Source: OSTI; NTIS; GPO Dep.

In the base contract, Combustion Power Co. developed commercial designs for a moving granular-bed filter (GBF). The proposed filter is similar to previous designs in terms of its shape and method of filtration. The commercial designs have scaled the filter from a 5 ft diameter to as large as a 20 ft diameter filter. In Task 2 of the Moving Bed-Granular Filter Development Program, all technical concerns related to the further development of the filter are identified. These issues are discussed in a Topical Report which has been issued as part of Task 2. Nineteen issues are identified in this report. Along with a discussion of these issues are the planned approaches for resolving each of these issues. These issues will be resolved in either a cold flow component test facility or in pilot scale testing at DOE's Power System Development Facility (PSDF) located at Southern Company Services' Wilsonville facility. Task 3 presents a test plan for resolving those issues which can be addressed in component test facilities. The issues identified in Task 2 which will be addressed in the component test facilities are: GBF scale-up; effect of filter cone angle and sidewall materials on medium flow and ash segregation; maximum gas filtration rate; lift pipe wear; GBF media issues; mechanical design of the gas inlet duct; and filter pressure drop. This document describes a test program to address these issues, with testing to be performed at Combustion Power Company's facility in Belmont, California.

14 (DOE/MC/28202–94/C0351) **Gasification Product Improvement Facility status.** Carson, R.D. (CRS Sirrine Engineers, Inc., Greenville, SC (United States)); Sadowski, R.S.; Skinner, W.H.; Dixit, V.B.; Lisauskas, R.A.; Johnson, S.A. CRS Sirrine Engineers, Inc., Greenville, SC (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC28202. (CONF-9406131–58: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE95001341. Source: OSTI; NTIS; GPO Dep.

The objective of the Gasification Product Improvement Facility (GPIF) project is to provide a test site to support early commercialization of the Integrated Gasification Combined Cycle (IGCC) technology. The design of this facility will by based on PyGas™, a patented air blown fixed bed gasification process. The GPIF will be capable of processing run-of-mine high swelling coals that comprise 87% of all Eastern US coals. The GPIF project is expected to deliver a gasifier design that will satisfy the criteria for good process performance and cost effectiveness. The PyGas™ process was conceived to handle high swelling coals, crack tars, and reduce ammonia and trace metal emissions. The GPIF program will generate useful scale up data. Initially, the PyGas™-IGCC systems will be offered as modular units for the repowering markets which will reduce the financial burden on utilities in comparison to large plants. In addition, modular designs will also reduce the plant construction schedules.

15 (DOE/MC/29246–3772) **Hot coal gas desulfurization with manganese-based sorbents: Quarterly report, January–March 1994.** Hepworth, M.T.; Slimane, R.B. Minnesota Univ., Minneapolis, MN (United States). Apr 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29246. Order Number DE95002104. Source: OSTI; NTIS; GPO Dep.

The focus of work being performed on Hot Coal Gas Desulfurization at the Morgantown Energy Technology Center is primarily in the use of zinc titanate sorbents; however, prior studies indicated that an alternate sorbent, manganese dioxide-containing ore in mixture with alumina (75 wt% ore + 25 wt% Al_2,O_3) may be a viable alternative to zinc-based sorbents. Manganese, for example, has a lower vapor pressure in the elemental state than zinc; hence, it is not as likely to undergo zinc-depletion from the sorbent surface upon loading and regeneration cycles. Also manganese oxide is less readily reduced to the elemental state than iron; hence, the range of reduction potentials for oxygen is somewhat greater than for zinc ferrite. In addition, thermodynamic analysis of the manganese-oxygen-sulfur system shows it to be less amenable to sulfation than zinc ferrite. Potential also exists for utilization of manganese at higher temperatures than zinc ferrite or zinc titanate. This Sixth Report documents progress in pellet testing two leading formulations; namely FORM 4-A and FORM 1-A via thermogravimetric analysis (TGA). The former is a high-purity carbonate-based material, and the latter is ore-based. Also fixed bed testing of formulation FORM 1-A is described. Included with this report is an Appendix which describes the formulations and the loading tests as performed via TGA. A 2-inch fixed-bed reactor is being utilized to subject a bed of FORM 4-A pellets to cyclic loading and regeneration. Preliminary results indicate that FORM 1-A can be loaded to approximately 12 per cent of its weight in sulfur prior to breakthrough up through sixteen cycles of loading and regeneration. The sulfur loading level drops from 18.2% for fresh pellets to 11.8% after the sixteenth cycle; however, there is no significant decrease in pellet sulfur-capacity after the ninth cycle. The kinetics during the loading and regeneration cycles are rapid.

16 (DOE/MC/30012–3861) **Advanced sulfur control concepts in hot-gas desulfurization technology: Quarterly report, April–June 1994.** Harrison, D.P. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering. Jul 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-94MC30012. Order Number DE94012287. Source: OSTI; NTIS; GPO Dep.

The primary objective of this research project is the direct production of elemental sulfur during the regeneration of known high temperature desulfurization sorbents. The contract was awarded to LSU on April 12, 1994, and this quarterly report covers accomplishments during the first 2 1/2 months of the project. Effort during the initial 2 1/2 month period has been limited to Tasks 1 and 2, and involves a search of the literature to identify concepts for producing elemental sulfur during regeneration of known metal oxide sorbents and a thermodynamic evaluation of these concepts. While searching and evaluating the literature is a continuing process, concentrated effort on that phase is now complete and a detailed summary is included in this report. Three possible concepts for the direct production of elemental sulfur were identified in the LSU proposal, and the literature search has not uncovered any additional concepts. Thus, the three concepts being investigated involve: (1) regeneration with SO_2, (2) regeneration with mixtures Of 02 and H_2O, and (3) regeneration with H_2O. While concept (3) directly

produces H_2S instead of elemental sulfur, the concept is included because the possibility exists for converting H_2S to elemental sulfur using the Claus process. Each of the concepts will ultimately be compared to the Direct Sulfur Recovery Process (DSRP) under development by RTI. DSRP involves initial sorbent regeneration to SO_2, and the inclusion of additional processing steps to reduce the SO_2 to elemental sulfur.

17 (DOE/METC/C–95/7158) **Facilitated transport ceramic membranes for high temperature H_2S removal.** Damle, A.S. (Research Triangle Inst., Research Triangle Park, NC (United States)); Gangwal, S.K.; Quinn, R.; Minford, E.; Herman, F.; Dorchak, T. USDOE Morgantown Energy Technology Center, WV (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). (CONF-940713–2: 3. international conference on inorganic membranes, Worcester, MA (United States), 10-14 Jul 1994). Order Number DE95002406. Source: OSTI; NTIS; GPO Dep.

Gas contaminant cleanup in the hostile process environments encountered in Integrated Gasification Combined Cycle (IGCC) systems has the potential for improving the economic viability of such advanced power systems. This paper presents evaluation of the technical feasibility of facilitated transport ceramic membranes for high temperature removal of H_2S from coal gas in IGCC systems. The facilitated transport membranes evaluated in this study consist of molten salts containing alkali and alkaline earth carbonates impregnated in to a ceramic microporous matrix. Both the disc and tubular membrane geometries were investigated. Permeation of H_2S across a membrane was determined in a simulated KRW coal gas environment at temperatures of 560 to 650 C and pressures of 50 to 200 psig. The experimental data suggest facilitated transport of H_2S across the molten salt ceramic membranes. However, the observed selectivities for H_2S with respect to other gases suffered from leakage through the unfilled pores of the ceramic matrix and membrane seals.

18 (DOE/METC/C–95/7161) **Test results from the Department of Energy's pressurized fluidized bed combustion hot gas cleanup program.** Dennis, R.A. (USDOE Morgantown Energy Technology Center, WV (United States)); Lippert, T.E.; Bruck, G.J.; Alvin, M.A.; Mudd, M.J.; Hoffman, J.D. USDOE Morgantown Energy Technology Center, WV (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). (CONF-940930–4: 11. annual international Pittsburgh coal conference: coal, energy and the environment, Pittsburgh, PA (United States), 12-16 Sep 1994). Order Number DE95002407. Source: OSTI; NTIS; GPO Dep.

In August 1989 a cooperative agreement was signed between Ohio Power Company, through its agent the American Electric Power Service Corporation, and the United States Department of Energy to assess the readiness and economic viability of high-temperature and high-pressure (HTHP) particulate filter systems for pressurized fluidized bed combustion (PFBC) applications. Through this agreement, known as the PFBC Hot Gas Cleanup (HGCU) Program, an advanced HTHP particulate filtration system has been tested with one seventh of the flow from the Tidd 70-MW(e) PFBC Clean Coal Demonstration Plant. This paper describes the results from over 3000 hours of testing at the Tidd PFBC and the results from additional proof-of-concept testing. The proof-of-concept testing has been used to validate ceramic candle filter elements, for use in future testing at the Tidd plant. Testing at the Tidd plant has utilized a three-cluster filter system designed and built by the Westinghouse Science and Technology Center, incorporating 384, 1.5-meter long silicon carbide candle filters. This system is filtering approximately 7360 actual cubic feet per minute of PFBC exhaust gas. The proof-of-concept test, which has accumulated over 1700 hours of test time, is being conducted with the full flow from a 10 MW(th) circulating pressurized fluidized bed combustor.

19 (DOE/PC/88819–T8) **Catalysts and process developments for two-stage liquefaction: First quarterly technical progress report No. 52, October 1, 1991–December 31, 1991.** Cronauer, D.C.; Swanson, A.J.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1991]. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001205. Source: OSTI; NTIS; GPO Dep.

Research under way in this project centers upon developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage, close-coupled catalytic process. As discussed in the previous quarterly report, the feedstock liquefaction studies for the three feedstocks (Black Thunder subbituminous coal, Martin Lake lignite, and Illinois No. 6 coal) were completed. Both Black Thunder coal and Martin Lake lignite gave lighter products than Illinois No. 6 coal at similar process conditions. Severe catalyst deactivation in the first stage was also observed with the Martin Lake lignite run. The first stage catalyst testing program was started (Task 3.2.1). After a successful reference run with Illinois No. 6 coal, a high-temperature run with AMOCAT™ 1C was completed, where the results showed that the first stage temperature should be no higher than 820°F. In addition, several runs were made both with Illinois No. 6 and Black Thunder coals using oil-soluble catalysts, Molyvan L, and molybdenum octoate in one or both stages. Overall, the results look very promising and show that dispersed molybdenum catalysts are good alternatives for Stage 1 or both 1 and 2, especially for Illinois No. 6 coal. In the case of Black Thunder coal, the conversion and yields were good, although the product quality was poorer, however, the use of slurry catalysts is still recommended.

20 (DOE/PC/88819–T12) **Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992.** Cronauer, D.C.; Swanson, A.J.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1992]. 433p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001948. Source: OSTI; NTIS; GPO Dep.

Research in this project centered upon developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage, close-coupled catalytic process. The major results are summarized here and they are described in more detail under each Task. In tasks for coal pretreatment and beneficiation, it was shown for coal handling that drying of both lignite or subbituminous coals using warm air, vacuum oven or exposing to air for long time was detrimental to subsequent liquefaction. Both laboratory and bench-scale beneficiations indicated that in order to achieve increased liquefaction yield for Illinois No. 6 bituminous coal, size separation with in sink-float technique should be used. For subbituminous coal, the best beneficiation was aqueous SO_2 treatment, which reduced mineral matter. In the case of lignite, the fines should be rejected prior to aqueous SO_2 treatment and sink-float gravity separation. In liquefying coals with supported catalysts in both first and second stages, coal conversion was highest (93%) with Illinois No. 6 coal, which also had the highest total liquid yield of 80%, however, the product contained unacceptably high level of resid (30%). Both low rank coals gave lower conversion (85–87%) and liquid yields (57–59%), but lighter products (no resid). The analysis of spent first stage catalysts indicated significant sodium and calcium deposits causing severe deactivation. The second stage catalysts were in better condition showing high surface areas and low coke and metal deposits. The use of dispersed catalyst in the first stage would combat the severe deactivation.

21 (DOE/PC/88819–T13) **Catalysts and process developments for two-stage liquefaction: Report No. 12, quarterly technical progress report, April 1, 1989–June 30, 1989, third quarter FY 1989.** Cronauer, D.C.; Swanson, A.J.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1994]. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001962. Source: OSTI; NTIS; GPO Dep.

Research underway in this project centers upon developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage close-coupled catalytic process. The project is being carried out under contract to the United States Department of Energy.

22 (DOE/PC/88819–T14) **Catalysts and process developments for two-stage liquefaction. Report No. 8: Quarterly technical progress report, second quarter FY 1989, January 1,**

1989–March 31, 1989. Cronauer, D.C.; Evans, A.J.; Furlong, M.W.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1994]. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001963. Source: OSTI; NTIS; GPO Dep.

Amoco under contract to the United States Department of Energy is developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage close-coupled catalytic process. Liquefaction experiments on beneficiated coal samples are reported for several catalysts.

23 (DOE/PC/88819–T15) **Catalysts and process developments for two-stage liquefaction. Report no. 16: Quarterly technical progress report, fourth quarter FY 1989, July 1, 1989–September 30, 1989.** Cronauer, D.C.; Swanson, A.J.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1994]. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001964. Source: OSTI; NTIS; GPO Dep.

Amoco is developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage close-coupled catalytic process. The project is being done under contract to the United States Department of Energy. Bench-scale beneficiation of Martin Lake lignite and Illinois No. 6 coal was completed in the preparation of low-ash samples for testing as liquefaction feedstocks. Size separation in combination with gravity beneficiation was effective in beneficiating Illinois No. 6 coal, as demonstrated by liquefaction runs made in the AU-51 flow unit. In the case of Martin Lake lignite, size separation in combination with aqueous sulfur dioxide treatment followed by density separation was shown to be effective in preparing a liquefaction feedstock. Second-stage catalyst testing is continuing. AMOCAT™-1C had previously been shown to outperform catalysts prepared using Cabot-based aluminas for denitrogenation, Ramscarbon removal, and conversion of coal resid. Commercial catalysts including UOP's RCM-4, Idemitsu's zeolite-containing catalyst, Shell 324, and Topsoe's TK-771 are about as active as AMOCAT™-1C for resid and Ramsbottom conversions. However, both Shell 324 and Topsoe's TK-771 are more active than AMOCAT™-1C for denitrogenation. A ruthenium-promoted version of AMOCAT™-1A prepared at SRI was no more active than AMOCAT™-1C. Future work will include continuous liquefaction runs with the samples of beneficiated lignite and base-line run with Illinois No. 6 coal. Catalyst testing in the Miniager will continue with the evaluation of novel catalysts.

24 (DOE/PC/88819–T16) **Catalysts and process developments for two-stage liquefaction: Report No. 20, quarterly technical progress report, October 1, 1989–December 31, 1989, first quarter FY 1990.** Cronauer, D.C.; Swanson, A.J.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1994]. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001965. Source: OSTI; NTIS; GPO Dep.

Research underway in this project centers upon developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage close-coupled catalytic process. The project is being carried out under contract to the United States Department of Energy. Bench-scale beneficiation of Martin Lake lignite and Illinois No. 6 coal was used to prepare low-ash coal samples for subsequent liquefaction in the AU-51 flow unit. Size separation in combination with gravity beneficiation was effective in beneficiating Illinois No. 6 coal, and size separation in combination with aqueous sulfur dioxide treatment followed by density separation was also productive for Martin Lake lignite. The liquefaction of these Illinois No. 6 samples resulted in significant differences in the yields of distillable product. The low density, float fraction was the preferred liquefaction feedstock due to its low ash content (6.5%) and high distillate yield. The high density, sink fraction should be rejected due to its high ash content (18.3%), even though this material functioned as a weak catalyst and produced light product.

25 (DOE/PC/88819–T17) **Catalysts and process developments for two-stage liquefaction, Report No. 24: Quarterly technical progress report - Second quarter FY 1990, January 1, 1990–March 31, 1990.** Cronauer, D.C.; Swanson, A.J.; Sajkowski, D.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1994]. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88PC88819. Order Number DE95001966. Source: OSTI; NTIS; GPO Dep.

Research underway in this project centers upon developing and evaluating catalysts and process improvements for coal liquefaction in the two-stage close-coupled catalytic process. The project is being carried out under contract to the United States Department of Energy. The preparation of samples of beneficiated Martin Lake lignite and Burning Star mine Illinois No. 6 coal and the liquefaction of these samples in the AU-51 flow unit is complete. Size separation in combination with gravity beneficiation was effective in beneficiating Illinois No. 6 coal, and size separation in combination with aqueous sulfur dioxide treatment followed by density separation was also productive for Martin Lake lignite. The liquefaction of these Illinois No. 6 samples resulted in significant differences in the yields of distillable product. The low density, float fraction was the preferred liquefaction feedstock due to its low ash content (6.5%) and high distillate yield. The high density, sink fraction should be rejected due to its high ash content (18.3%), even though this material functioned as a weak catalyst and produced light product. Sulfurous acid treatment and sink/float beneficiation of Martin Lake lignite was clearly beneficial. Ash levels in the lignite were reduced, conversion was slightly increased, and an all-distillate product was generated.

26 (DOE/PC/90057–T3) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992).** Reagan, W.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1992]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001937. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company is investigating a selective catalytic cracking process to convert the Fischer-Tropsch gasoline and wax fractions to high value transportation fuels. The wax feedstock for this program is a commercial sample of Fischer-Tropsch product from Sasol. The wax feedstock readily converts over conventional fluid catalytic cracking (FCC) catalysts (85%+ conversion) to high yields of C_4-gas and gasoline. The work in this area focuses on the effects of process variables and catalyst types. Some initial wax cracking tests on the pilot plant unit continue. These test results also show high conversion (85%+) of the wax feedstock to light gases and gasoline. The ranking of the three zeolite catalyst types for C_4-C_5 iso-olefin production is similar to the findings of the small scale screening test program. The catalytic cracking test results from both the small scale test unit and the pilot plant suggest that very mild process conditions and low activity catalysts are needed to lower the overall wax conversion. The target light olefin yields vary with catalyst type and the process conditions.

27 (DOE/PC/90057–T4) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 23: Quarterly technical progress report for third quarter fiscal year 1992 (April 1–June 30, 1992).** Reagan, W.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1992]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001938. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company is investigating a selective catalytic cracking process to convert the Fischer-Tropsch naphtha and wax fractions to high value transportation fuels. The wax feedstock for this program, a commercial sample of Fischer-Tropsch product from Sasol, is a high melting point, (>220 F), high boiling range (50% boiling above 1,000 F), largely paraffinic material. Work this Quarter centers on the study of various types of HZSM-5 and Y zeolite catalysts. The wax cracking tests on the pilot plant unit were completed last Quarter. The initial product yields have now been corrected for gas and liquid component distribution. Several additional product quality measurements have been completed. The distillate product fraction, boiling between 430–650 F, obtained from the Y zeolite catalyst run, has a high quality Cetane Index of 59. These test results also show high conversion (85%+) of the wax feedstock to light gases and gasoline. The ranking of the three zeolite catalyst types for C_4-C_5 iso-olefin production is similar to

the findings of the small scale screening test program. It is not possible to obtain test results at a wide variety of conversion levels on the pilot plant due to operating constraints.

28 (DOE/PC/90057–T5) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992).** Reagan, W.J. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1992]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001939. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company is investigating a selective catalytic cracking process to convert the Fischer-Tropsch gasoline and wax fractions to high value transportation fuels. The wax feedstock for this program, a commercial sample of fischer-Tropsch product from Sasol, is a high melting point, (>220 F), high boiling range (50% boiling above 1,000 F), largely paraffinic material. The wax feedstock readily converts over conventional fluid catalytic cracking (FCC) catalysts (85%+ conversion) to high yields of C_4-gas and naphtha. Three different types of zeolite catalysts and one amorphous cracking catalyst show wide variations of product yields as a function of wax feedstock conversion. The Beta and HZSM-5 zeolite catalysts have higher target light olefin (isobutylene and isoamylenes) yields than the Y zeolite sample. The HSZM-5 sample also produces the highest yields of propylene. Further work continues on various commercial and experimental HZSM-5 samples. There are some clear wax conversion variations among the samples. However, product selectivity differences are small and difficult to measure accurately. A series of rare earth exchanged Y zeolite catalysts show the expected rare earth effect: increased rare earth exchange gives higher naphtha and lower olefin yields. Several new FCC catalysts with low (10%) zeolite content have been prepared and analyzed. The zeolite Beta sample appears to have a lower hydrothermal stability than zeolite Y catalyst. The catalytic cracking test results from both the small scale test unit and the pilot plant suggest that very mild process conditions and low activity catalysts are needed to lower the overall wax conversion. The target light olefin yields vary with catalyst type and the process conditions.

29 (DOE/PC/90057–T6) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993).** Schwartz, M.M. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1993]. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001940. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company is investigating a selective catalytic cracking process to convert the Fischer-Tropsch gasoline and wax fractions to high value transportation fuels. Experiments with the LaPorte wax as feedstock demonstrated the feasibility of the concept of selective attrition of the FCC catalyst. Experiments comparing the Sasol and LaPorte wax feedstocks with USY, Beta and HZSM-5 catalysts showed that the type of FCC catalyst has a major impact upon product yields and quality. For a given catalyst, both feedstocks have similar conversion values. The yields of the major catalytic cracking products, light olefins, naphtha and distillate, do not vary significantly with the two wax feedstocks. The methanol etherification of the light naphtha product from the pilot plant F-T wax cracking runs yields a mixed ether product. Etherification runs were completed on two additional pilot plant light naphthas using two commercial etherification catalysts, one of which contains a noble metal, in addition to the strong acid functionality. Isoolefin conversion values were similar for the two catalysts and three feedstocks in the absence of H_2. With H_2 present, product color is improved; but overall the presence of H_2 is not desirable because olefins are saturated, which results in decreased production of ethers and decreased product octane number. Economic analysis of the eight pilot plant runs that were performed under Task 4 showed that the net production values for a complex refinery were always higher than for a simple refinery (no ether unit).

30 (DOE/PC/90057–T7) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 33: Quarterly technical status report for third quarter fiscal year 1993 (April 1–June 30, 1993).** Schwartz, M.M. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1993]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001941. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company is investigating a selective catalytic cracking process to convert the Fischer-Tropsch gasoline and wax fractions to high value transportation fuels. The primary wax feedstock for this program is a commercial sample of Fischer-Tropsch product from Sasol. A second feedstock being used is a high melting point paraffinic wax that was produced by the Liquid Phase F-T demonstration plant at LaPorte, Texas, and is contaminated with about 2.5% of finely dispersed iron F-T catalyst. Research octane numbers (RON) and Motor octane numbers (MON) were determined in engine tests using 10% blends of the mixed ether products (previously prepared under Task 5) with unleaded regular gasoline.

31 (DOE/PC/90057–T8) **The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993).** Schwartz, M.M. Amoco Oil Co., Naperville, IL (United States). Research and Development Dept. [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC90057. Order Number DE95001942. Source: OSTI; NTIS; GPO Dep.

Amoco Oil Company is investigating a selective catalytic cracking process to convert the Fischer-Tropsch gasoline and wax fractions to high value transportation fuels. This report contains the most current and accurate information and projections of the scope of work, schedules, milestones, staffing/manpower plan and costs. Naphtha that was produced by the Liquid Phase F-T demonstration plant at LaPorte, Texas was received and characterized. Three pilot plant runs were completed using Sasol wax as feedstock. The catalysts used were 10% steamed USY, 10% steamed Beta, and standard equilibrium USY. The 10% Beta catalyst gave much higher yields of propylene and butylenes than the USY-based catalysts, in agreement with previous results. Characterization of the IBP-430, 430–650 and 650+ F fractions of these runs is incomplete. The 10% Beta catalyst made 430–650 F product with the highest cetane index (60.9), but the 430–650 F product from all three runs would be excellent stock for blending into diesel fuel.

32 (DOE/PC/90293–T14) **High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994.** Winnick, J. Georgia Inst. of Tech., Atlanta, GA (United States). School of Chemical Engineering. [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90293. Order Number DE95001961. Source: OSTI; NTIS; GPO Dep.

High temperature membrane separation techniques have been applied to gas mixtures involved in coal utilization. For coal gasification, H_2S has been removed from the syn-gas stream, split into hydrogen which enriches the syn-gas, and sulfur which can be condensed from an inert gas sweep stream. For coal combustion, SO_2 has been separated from the flue gas, with concentrated SO_3 produced as a by-product. Both Processes appear economically viable, but each requires fundamental improvements: both the H_2S and SO_2cells require more efficient membranes and the H_2S cell needs a more efficient anode. Membranes will be fabricated by either hot-pressing, impregnation of sintered bodies, or tape casting. Research conducted during the present quarter is highlighted.

33 (DOE/PC/91034–T9) **The economical production of alcohol fuels from coal-derived synthesis gas: Eleventh quarterly technical progress report, April 1, 1994–June 30, 1994.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Jul 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91034. Order Number DE95002620. Source: OSTI; NTIS; GPO Dep.

The West Virginia University (WVU) plug-flow microreactor system is now functioning. Testing runs on this system with two methanol catalysts have commenced. The results are consistent with those published by two industrial laboratories, at least under limited conditions. Modifications will be made to test the catalysts under a broader range of conditions. Screening of the catalysts

prepared at WVU is expected to commence shortly with this reactor system. The second reactor system at WVU is awaiting a replacement interface board for temperature control. Additional hardware has been ordered for this system so that it can be used either to screen additional catalysts or to obtain kinetic data on selected catalyst samples. At Union Carbide, the reactor units will be operated under conditions such that they will not need to be modified to prevent secondary reactions. However, one of the reactors will be coated. Tests will be run to ensure that no extraneous effects are observed. Catalyst synthesis at WVU has focused on chevrel-phase and molybdenum azide compounds. These and previously synthesized materials have been characterized in terms of their surface area as well as by x-ray diffraction and x-ray fluorescence. A series of experiments has been completed investigating the influence of temperature and flow rate on the physical properties of molybdenum sulfides, iron nitrides and iron carbides. The series of transition metal catalysts to be, run in the reactor units at Union Carbide has been finalized. Modelling studies are continuing satisfactorily. The. more-complicated reaction scheme which can account for individual alcohols and ketones in a plug-flow reactor is found to mimic experimental data for a fixed bed, as reported in the literature. A packed-bed membrane reactor can be shown to increase the yields of individual alcohols and ketones, relative to the plug-flow reactor.

34 (DOE/PC/91304–T11) **Low severity upgrading of F-T waxes with solid superacids: Quarterly report, 1 June 1994–31 August 1994.** Tierney, J.W.; Wender, I. Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering. [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91304. Order Number DE95001946. Source: OSTI; NTIS; GPO Dep.

After the authors discovered that aromatics and especially naphthenes can be alkylated by long-chain paraffins, they used short chain paraffins and found they could alkylate aromatics with ethane and ethylene under the same conditions (160 C and 350 psig of H_2). The hydrocracking of alkylphenolics and alkylaromatics was studied using the same catalyst. It appears that phenolic-OH groups inhibit activity of $Pt/ZrO_2/SO_4$ catalyst in alkylation with paraffins. However, a paraffinic side chain attached to the phenol reduces the inhibiting effect of phenolic -OH groups. In situ FT-IR analysis indicated that the presence of phenolic -OH groups affects the ratio of Bronsted to Lewis acid sites. The results suggest that the nature of the aromatic can control the distribution of products obtained in the alkylation of aromatics with alkanes. Results are discussed for the alkylation of aromatics with ethane and ethylene and for hydrocracking of alkylaromatics and alkylphenolics.

35 (DOE/PC/91310–T11) **The use of solid-state NMR techniques for the analyses of water in coal and the effect of different coal drying techniques on the structure and reactivity of coal: Quarterly report, June 1, 1994–August 31, 1994.** Netzel, D.A. University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst. [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91310. Order Number DE95002429. Source: OSTI; NTIS; GPO Dep.

The overall objectives of this study are to develop a nuclear magnetic resonance (NMR) method for measuring the water in coal, to measure the changes in coal structure that occur during coal drying, to determine what effect water has on retrograde/condensation reactions, to determine the mechanism by which water may impact coal reactivity toward liquefaction, and to conduct D_2O exchange studies to ascertain the role of water in coal liquefaction. The objectives for this quarterly report period were (1) to conduct repeat coal liquefaction experiments on the North Dakota Beulah Zap and Utah Blind Canyon coals that were premoisturized, dried thermally, dried with microwave radiation, and dried using the chemical dehydration method; (2) to analyze the gases produced during liquefaction using gas chromatography; (3) to measure the ratio of light and heavy oils in the coal liquids using gas chromatography; and (4) to assemble the data for the final report. Experimental data is presented in the report.

36 (DOE/PC/92118–T7) **Bench-scale demonstration of biological production of ethanol from coal synthesis gas: Quarterly report, April 1, 1994–June 30, 1994.** Engineering Resources, Inc., Fayetteville, AR (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92118. Order Number DE95002636. Source: OSTI; NTIS; GPO Dep.

CSTR studies are being performed to measure the effects of important design parameters such as dissolved CO concentration, pH, nutrients composition and concentration, gas retention time and liquid dilution rate on reactor performance. The results of these studies will yield valuable design information on the variables affecting the ethanol to acetate product ratio and culture stability. Ethanol concentrations of 13 g/L with ethanol to acetate product ratios of 13 mol/mol have been attained at an 18 min gas retention time without cell recycle. A comparison of product recovery techniques shows that direct distillation or solvent extraction, followed by pervaporation or azeotropic distillation, is most appropriate for ethanol recovery.

37 (DOE/PC/92120–T5) **Advanced coal liquefaction to Pittsburgh Energy Technology Center: Quarterly report, April 1, 1994–June 30, 1994.** Media and Process Technology, Inc., Pittsburgh, PA (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93PC92120. Order Number DE95002640. Source: OSTI; NTIS; GPO Dep.

A meeting was held between Media and Process Technology Inc. (M&P) and PETC to review the result from the separation of model compounds using modified membranes. Also a reaction system was defined for studying the use of catalytic membrane to enhance the conversion of a model compound. Compound No. 9 was selected as a first candidate. Previously M&P had demonstrated the separation of this compound from the solvent, tetralin, using a modified membrane, Si 248 at 25° and 80°C. We anticipated this membrane or other modified membranes with a smaller pore size should be sufficient for the separation of the compound at a higher temperature. After reviewing the reference provided by PETC, reaction at ~400°C was selected. In a literature study with a closed vessel using carbon black as a catalyst, a conversion of ~44% and selectivity of ~90% were obtained. The reaction products were documented in the reference. They may permeate selectively through the membrane, resulting in the yield improvement. A carbon catalyst was provided by PETC for this experimental study. Selective removal of compound No. 9 in tetralin was demonstrated in a previous study using Si 248 at 25° to 80°C. In this quarter, this membrane was used to evaluate its separation behavior at a higher temperature. Permeation of tetralin from 25° to 180°C was performed. It appeared that tetralin degraded gradually at the high temperature, i.e., 150° and above. This degradation resulted in fouling the modified membrane. Eventually the membrane delivered no flux even under a high pressure drop. The results of the permeation study is chronologically presented in this report.

38 (DOE/PC/92521–T131) **Upgrading mild gasification liquids to produce electrode binder pitch: [Quarterly] technical report, December 1, 1993–February 28, 1994.** Knight, R.A. (Institute of Gas Technology, Chicago, IL (United States)). Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94012558. Source: OSTI; NTIS; GPO Dep.

The objective of this program is to investigate the production of electrode binder pitch, valued at $250–$300/ton, from mild gasification liquids. The IGT MILDGAS process pyrolyzes coal at 1000°–1500°F and, with Illinois coal, the 750°F+ distillation residue (crude pitch) comprises 40–70% of the MILDGAS liquids, representing up to 20 wt% of maf feed coal. The largest market for pitch made from coal liquids is the aluminum industry, which uses it to make carbon anodes for electrolytic furnaces. In this project, crude MILDGAS pitch is being modified by a flash thermocracking technique to achieve specifications typical of a binder pitch. Last year, a pitch thermocracking unit was constructed for operation at 1200°–1600°F. Reactor design features and process conditions are being examined to optimize the properties of the finished pitch. In the current year, improvements to the thermocracker are being made for better gas and pitch flow control, continuous electronic monitoring of feed rate and pressures, and improvements to allow

longer tests. Tests are being conducted under both inert and reducing gases. During the current quarter, equipment modifications, calibrations, and shakedown were completed, and thermocracking tests were resumed. One test was completed at 1600°F in N_2 with a pitch rate of 11 g/min. Data from this and following tests will be presented in the next quarterly report. During the next quarter, thermocracking tests will be completed and selected products (pitch and/or pitch coke) will be submitted to an aluminum company testing lab for production and evaluation of test electrodes.

39 (DOE/PC/93205–T4) **Short contact time direct coal liquefaction using a novel batch reactor: Progress report, May 16, 1994–September 15, 1994.** Klein, M.T.; Calkins, W.H. Delaware Univ., Newark, DE (United States). Center for Catalytic Science and Technology. 30 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93205. Order Number DE95002628. Source: OSTI; NTIS; GPO Dep.

The objective of this research is to optimize the design and operation of the bench scale batch reactor (SCTBR) for coal liquefaction at short contact times (0.01 to 10 minutes or longer). This reactor is simple enough and low enough in cost to serve as a suitable replacement for the traditional tubing-bomb reactors for many coal liquefaction and other high-pressure, high-temperature reaction studies. The liquefaction of selected Argonne Premium coals and the role of organic oxygen components of the coal and their reaction pathways at very low conversions are being investigated.

40 (DOE/PC/93215–T3) **Novel microorganism for selective separation of coal from ash and pyrite: Third quarterly technical progress report, March 1, 1994–May 31, 1994.** Misra, M.; Smith, R.W.; Raichur, A.M. Nevada Univ., Reno, NV (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93215. Order Number DE95001960. Source: OSTI; NTIS; GPO Dep.

The selective separation of pyrite and ash-forming minerals from coal can be accomplished by flotation, agglomeration and selective flocculation. The methods currently used for selective flocculation of coals include addition of natural or synthetic polymeric flocculants along with precise pH control. In some cases, these flocculants are nonselective or work imperfectly. It is known that many highly charged planktonic algae and bacteria will adhere to certain solid surface if the charge or hydrophobic interaction between the organism and the solids are favorable for adhesion. The resultant microorganism-mineral entities if formed can flocculate and can be separated. In addition, many living organism produce extracellular biopolymers that can also cause flocculation. The microorganism, M. phlei, has the properties of being both highly charged and highly hydrophobic. The aim of the present investigation is to study the effectiveness of M. phlei and biopolymers derived from the organism for selective flocculation of fine coal from ash and pyrite.

41 (DOE/PC/93224–T4) **Large scale solubilization of coal and bioconversion to utilizable energy: Technical progress report, July 1, 1994–September 30, 1994, fourth quarterly.** Mishra, N.C. South Carolina Univ., Columbia, SC (United States). Dept. of Biological Sciences. [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93224. Order Number DE95002625. Source: OSTI; NTIS; GPO Dep.

In order to develop a system for a large scale coal solubilization and its bioconversion to utilizable fuel, we plan to clone the genes encoding Neurospora protein that facilitate depolymerization of coal. We also plan to use desulfurizing bacteria to remove the sulfur in situ and use other microorganisms to convert biosolubilized coal into utilizable energy following an approach utilizing several microorganisms (Faison, 1991). In addition the product of coal solubilized by fungus will be characterized to determine their chemical nature and the mechanism of reaction catalyzed by fungal product during in vivo and in vitro solubilization by the fungus or purified fungal protein.

42 (ETDE/JP-mf–95714822) **Brown coal liquefaction project.: Technical summary.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 75p. (In Japanese). Order Number DE95714822. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The present report summarized the brown coal liquefaction project executed to establish the conversion technology to clean and economical energy from the coal of which the share is 30% in the worldwide energy supply. The project was executed during 1981 through 1993 with Australian Victoria brown coal selected as experimental coal, and terminated. In the basic phase of development because of two-stage process, the primary hydrogenation, bottom recycling and solvent deashing were studied together with the secondary hydrogenation catalysis on the fixed floor. The pilot plant gave a higher liquefied oil yield than 50%. In the scale-up phase, the possibility of enlarging the scale was seen through conceptually designing a 6000t/d demonstration plant. In 2011, the crude oil-converted substantial price of liquefied oil by the commercial plant will be 33.4 dollars/B, which will be slightly lower than the estimated crude oil price at that time. Therefore, foreseen was its commercialization at the beginning of the 21st century. The crude oil price has fallen and the environmental issue has changed since the project was initiated. However, the coal liquefaction is becoming more necessary in relation to diversifying the primary energy resources. 5 figs., 7 tabs.

43 (ETDE/JP-mf–95714826) **Development of brown coal liquefaction technology. 2.: Economical performance investigation on the brown coal liquefaction process.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 287p. (In Japanese). Order Number DE95714826. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Studying the competitiveness of Australian brown coal liquefied oil under project proceeding with the crude oil around 2030, the liquefaction process was evaluated in economical performance. Judging from the forecast of oil product supply and demand in Japan in 2010, the brown coal liquefied oil introduction is estimated at 9 to 15 million kl per year for supplementing the importation. To evaluate the liquefied oil, its fraction which was equal to that of crude oil in boiling point was evaluated on the supposition that both frictions were equal also in product price. Then, they are compared in price estimated with their respective yields which were taken into consideration. The financial analysis was made by fixing, by discounted cash flow, the selling price which gave the designated investment profit. If the commercial plant construction cost can be reduced by 20%, the liquefied oil will be costwise competitive with the crude oil around 2030. With an improvement in yield, it will become more competitive. If both Victoria State and Australia as a country gain a larger profit than the standardized one, materialization is possible notwithstanding low profitability on the investing side. Judging from the comparison between the convenience and cost on Japanese side, materialization is made possible by the obtainment of a higher economic internal rate of return than the fund procurement cost of 11%. 45 figs., 104 tabs.

44 (ETDE/JP-mf–95714827) **Importance and problems of coal conversion technology before 2010.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 131p. (In Japanese). Order Number DE95714827. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Knowledge was put in order about the structure, physical properties and reaction control of coal to establish a high-degree coal conversion technology before 2010. The release of aggregated structure is indispensable to heighten the efficiency of coal liquefaction. The two-stage and multi-stage liquefaction is related to the result of such structural researches. The existence mode of heteroatoms in coal was elucidated, and how to remove them was studied with an investigation on their reaction behavior. Ash plays an important role in the coal gasification, and result of research was also explained on its effect on the reactivity and environment. The distribution of liquefied and hydropyrolyzed products was studied. Then, the high-order coal structure was predicted with evaluation of thermal reactivity. The composite pyrolysis of coal

with polyolefin as a new radical source is significant as a cotreatment with wastes. The rapid pyrolysis which is a promising next-generation technology is being developed through a basic analysis of cross-linked high-molecular model. Pyrolytic kinetics of low-molecular model was also studied as a structural unit of coal. 188 refs., 90 figs., 23 tabs.

45 (ETDE/JP-mf–95714828) **Development of the next generation catalyst for coal direct liquefaction. 2.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 79p. (In Japanese). Order Number DE95714828. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Investigations were conducted on research examples of catalyst bases newly developed and their processing, and research and development policies were proposed for the next generation coal liquefaction catalyst. As for highly dispersed catalysts, studies were made on comparison of activity of various metal compounds, sulfur compound as promoter, and metal adding effects. As a result, it was found that Mo based catalyst is high in hydrogenation ability, and the activity markedly increases by addition of sulfur. It is considered important to accumulate data on organic Mo complex hereafter. As to the ion exchange method for the loading of catalyst, a study was made on exchange capacity and factors prescribing the exchange amount, and a discussion was made on possibility of modifying the coal surface. High activity was observed in adding iron as liquefaction catalyst, and iron is expected to be one of the next generation catalysts. With relation to the impregnation method, investigation and study were conducted on possibilities of using hydrocarbons, oxygenated solvent, supercritical carbon dioxide gas and water as impregnating complexes, additives which accelerates coal swelling phenomena, etc. 109 refs., 23 figs., 26 tabs.

46 (ETDE/JP-mf–95714830) **Preliminary investigation on Japan's cooperation with Mongolia for coal liquefaction technology.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 80p. (In Japanese). Order Number DE95714830. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

As part of a feasibility survey promoted by NEDO on location of overseas coal liquefaction facilities, a survey was made in Mongolia. For the purpose of producing automobile-use gasoline and power generation-use diesel oil from coal resource in Mongolia, the Mongolian government makes studies in their research institutes and expects assistance from Japan at the same time. Mongolian coal is distributed almost in the whole country, 80% of which are brown coal, and 20% are bituminous coal and subbituminous coal. Mongolian coal is generally much in ash and comparatively less in sulfur. As for a study of applicability of coal liquefaction technology, an investigation was carried out into low-temperature carbonization technology which had been industrialized by developed countries. It is presumed that low-temperature carbonization is applicable from the following points: low-temperature carbonization is a relatively simple and easy-handling technology; it produces coal liquid and a large amount of char which can be used as fuel for power generation boiler; data from the U.S. demonstrative plant are similar in properties to analytical values of sample coals from Mongolia. 3 refs., 8 figs., 29 tabs.

47 (ETDE/JP-mf–95714831) **Fiscal 1993 investigational research on the development of a peat utilization mild gas production system.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 126p. (In Japanese). Order Number DE95714831. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

A study was conducted on mild gasification of peat of Thailand of which the discussion was agreed between Japan and Thailand. An experiment using the fluidized bed gasifier was carried out with peat from the Narathiwat swamp in Thailand as sample. As a result, it was found that peat is needed to be so dry as to be 10% or below in the remaining water content, and that the feed hopper should be made two-stepped for stable supply of sample peat. It was also confirmed that the appropriate temperature of the gasifier is approximately 700°C in case of aiming at increasing the calorific value of gas product, and approximately 800°C in case of aiming at increasing the carbon conversion ratio and the amount of gas product. As to the feasibility study on plant construction, economical efficiency was evaluated of a gasification plant having a treatment capacity of 100,000 ton/year dry peat. The result indicated that a construction cost of the gasification plant totals 8.0-8.7 billion yen, and a gas production cost is 7.72-15.16 yen/1,000 kcal of calorific value. The costs estimated largely increased over the commercial fuel price in Thailand. 9 refs., 30 figs., 31 tabs.

48 (IS-M–798) **Deashing of coal liquids by sonically assisted filtration.** Slomka, B.J. Ames Lab., IA (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9408179–1: Alternative fuels of the ACS national meeting, Pittsburgh, PA (United States), Aug 1994). Order Number DE95001665. Source: OSTI; NTIS; GPO Dep.

This project seeks to improve the effectiveness and reduce the cost of coal liquefaction by novel applications of sonic and ultrasonic energy. The specific purpose of this project is to develop and improve means for the economical removal of dispersed solid particles of ash, unreacted coal, and spent catalyst from direct and indirect coal liquefaction resids by using sonic or ultrasonic waves. Product streams containing solids are generated in both direct and indirect coal liquefaction processes. Direct coal liquefaction processes generate liquid products which contain solids including coal-originated mineral matter, unreacted coal, and spent dispersed catalyst. The removal of these solids from a product stream is one of the most difficult problems in direct coal liquefaction processes. On this report, results are discussed for sonically assisted cross-flow filtration of V-1067 resid, diluted with No. 2 fuel oil, and sonically assisted batch filtrations of solids concentrates from continuous cross-flow filtration experiments.

49 (IS-M–799) **Separation of solids from coal liquefaction products using sonic waves.** Slomka, B.J. Ames Lab., IA (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9407137–1: 8. annual meeting of the consortium for fossil fuel liquefaction science, Snowbird, UT (United States), 6-9 Jul 1994). Order Number DE95001679. Source: OSTI; NTIS; GPO Dep.

Product streams containing solids are generated in both direct and indirect coal liquefaction processes. This project seeks to improve the effectiveness of coal liquefaction by novel application of sonic and ultrasonic energy to separation of solids from coal liquefaction streams.

50 (NEDO-P–9309) **Investigation on the development of coprocessing technology.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 126p. (In Japanese). Order Number DE95714829. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The paper collects most up-to-date information on coprocessing technology through literature surveys and field surveys, and discusses a possibility of its commercialization. Coprocessing is said to be higher in equipment efficiency, lower in raw material cost, easier in establishing the facilities attached to the oil refinery, and higher in economical efficiency, as compared with the coal liquefaction. The U.S. considers locational conditions and the oil price, and proceeds to the technical development so that they can select either coprocessing technology or coal liquefaction technology. Commercialization of the coal liquefaction technology including coprocessing is hard to be realized under the present oil price, 20 dollars/barrel, but seems to be possible in the future under the condition, 34 dollars/barrel, supported by the technical development to reduce the cost of coal liquid. There are a lot of similarities between coprocessing technology and coal liquefaction technology, and it is easy to divert the details of the technologies. The U.S. makes the development for commercialization of coprocessing

technology ahead of the development of coal liquefaction technology, considering pursuit of economical efficiency as a target. 19 refs., 36 figs., 30 tabs.

51 (OCDO–94012360) **New, high-capacity, calcium-based sorbents: Calcium silicate sorbents: Final report.** Kenney, M.E.; Chiang, Ray-Kuang. Case Western Reserve Univ., Cleveland, OH (United States). Dept. of Chemistry. 30 Sep 1993. 36p. Sponsored by Ohio State Government, Columbus, OH (United States). Grant OCRC/92-1.8. Source: OSTI; Ohio Coal Development Office, 77 S. High St., P.O. Box 1001, Columbus, OH 43266-0001.

A search is being carried out for new calcium-based SO_2 sorbents for induct injection. More specifically, a search is being carried out for induct injection calcium silicate sorbents that are highly cost effective. The objectives of the past year were to study the sorption of SO_2 by representative calcium silicates, to study the composition of the $Ca(OH)_2$-fly ash sorbent, and to install a humidity sensor in the sorption system.

52 (SAND–94-1940C) **Evaluation of fine-particle catalysts: Activity testing results and phase identification using Mossbauer spectroscopy.** Stohl, F.V. (Sandia National Labs., Albuquerque, NM (United States)); Diegert, K.V.; Goodnow, D.; Rao, K.R.P.M.; Huggins, F.; Huffman, G.P. Sandia National Labs., Albuquerque, NM (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409168–7: Coal liquefaction and gas conversion contractors' review conference, Pittsburgh, PA (United States), 7-8 Sep 1994). Order Number DE95001625. Source: OSTI; NTIS; GPO Dep.

To evaluate and compare the activities/selectivities of fine- particle size catalysts being developed in the DOE/PETC Advanced Research (AR) Coal Liquefaction program by using standard coal liquefaction activity test procedures. Previously reported results have described the standard test procedure that was developed at Sandia to evaluate fine-particle size iron catalysts being developed in DOE/PETC's AR Coal Liquefaction Program. This test uses DECS-17 Blind Canyon Coal, phenanthrene as the reaction solvent, and a factorial experimental design that enables evaluation of a catalyst over ranges of temperature (350 to 400°C), time (20 to 60 minutes), and catalyst loading (0 to 1 wt% on a dmmf coal basis). Testing has been performed on Pacific Northwest Laboratories' (PNL) 6-line ferrihydrite catalyst. Results showed that this catalyst is more active than the University of Pittsburgh's sulfated iron oxide catalyst that was evaluated previously. PNL has also produced two additional batches of catalyst in an effort to optimize their preparation procedures for larger batches. Sandia has observed significant differences in activities among these three catalysts; these differences might be due to particle size effects, the type of drying procedure, or the amount of moisture present. Mossbauer characterization of the iron phases in the coal, catalyst precursors, and tetrahydrofuran (THF) insoluble material from liquefaction reactions has been performed on the University of Pittsburgh's catalyst and the first PNL catalyst that was tested at Sandia. The Mossbauer results were obtained at the University of Kentucky and will be presented. Future work will include testing additional catalysts being developed in the AR Coal Liquefaction Program, developing procedures to characterize reaction products, and determining the kinetics of the reactions.

0105 Products and By-Products

Refer also to citation(s) 38

53 (KFK–5169) **Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions.** Pruente, W. Kernforschungszentrum Karlsruhe GmbH (Germany). Abt. fuer Angewandte Systemanalyse; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Wirtschaftswissenschaften. Jul 1993. 255p. (In German). Order Number DE95708620. Source: OSTI; NTIS (US Sales Only).

Central themes in the general energy debate are the significance and possible uses of fossil energy sources. Since the worldwide deposits of coal represent the largest reserves of fossil energy, coal will remain indispensable in the long term as well and its use as a primary energy source will even increase. In this regard, aspects such as economic efficiency, environmental impact and security of supply raise a series of questions which must be faced by the suppliers and users of coal. Against this background, attempts are being made to improve known coal technologies and to develop new technologies. One promising technology with new application potential for coal consists of treating coal (70% in weight) with water (30% in weight) to form a homogeneous suspension which may, according to the application, result in advantages in all areas of coal handling and use. Using multidimensional examinations, this dissertation should provide both economic and technical criteria to assess the relevance for future energy provision of coal in the form of coal-water-suspensions (CWS). In this respect, technical analyses show the development potential not only of existing commercial processes but also of new processes using the future technology of coal-water-suspension. An example cited is the combination of coal treatment and CWS production with subsequent economical and environment-friendly pipeline transport to a combined power station. This technology chain can be used to improve the attractiveness of remote coal-mining regions where production is being called into question due to logistical problems. At the same time, it is possible to convert the energy effectively and with few harmful substances, according to the latest technology. (orig.)

0106 Properties and Composition

Refer also to citation(s) 35, 62, 1293

54 (DOE/PC/91047–T9) **Investigation of coal structure: Final report.** Nishioka, Masaharu. Viking Systems International, Inc., Pittsburgh, PA (United States). Mar 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC91047. Order Number DE95001949. Source: OSTI; NTIS; GPO Dep.

A better understanding of coal structure is the first step toward more effective utilization of the most abundant hydrocarbon resource. Detailed characterization of coal structure is very difficult, even with today's highly developed analytical techniques. This is primarily due to the amorphous nature of these high-molecular-weight mixtures. Coal has a polymeric character and has been popularly represented as a three-dimensional cross-linked network. There is, however, little or no information which positively verifies this model. The principal objective of this research was to further investigate the physical structure of coal and to determine the extent to which coal molecules may be covalently cross-linked and/or physically associated. Two common characterization methods, swellability and extractability, were used. A technique modifying the conventional swelling procedure was established to better determine network or associated model conformation. A new method for evaluating coal swelling involving laser scattering has also been developed. The charge-transfer interaction is relatively strong in high-volatile bituminous coal. Soaking in the presence of electron donors and acceptors proved effective for solubilizing the coal, but temperatures in excess of 200 C were required. More than 70 wt% of the coal was readily extracted with pyridine after soaking. Associative/dissociative equilibria of coal molecules were observed during soaking. From these results, the associated model has gained credibility over the network model as the representative structure of coal. Significant portions of coal molecules are unquestionably physically associated, but the overall extent is not known at this time.

55 (DOE/PC/91284–11) **Nitration of polynuclear aromatic hydrocarbons in coal combustors and exhaust streams: Quarterly report, April 1, 1994–June 30, 1994.** Yu, Liya; Cho, Sunghwan; Hildemann, L.; Niksa, S. Stanford Univ., CA (United States). Dept. of Civil Engineering. Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91284. Order Number DE95002432. Source: OSTI; NTIS; GPO Dep.

The objectives of this three-year project are to (1) identify the conditions which promote the nitration of PAH during primary combustion, reburning, hot gas cleanup, and particulate removal; and (2) investigate the potential relationship between NO_x abatement

and PAH nitration. A novel coal flow reactor burning actual coal products operates over the activity during this quarter on the sample preparation side was devote to experiments on the oxidative pyrolysis of coal volatiles. Previously, our experiments characterized primary devolatilization and secondary volatiles pyrolysis. For the first time we report complete product distributions for controlled extents of oxidative pyrolysis at various oxygen levels. However, we also found out that the levels of PAH in oxidative pyrolysis products are too low to recover for detailed chromatographic analysis, even at oxygen concentrations as low as 2%.

56 (DOE/PC/92521–T151) **Characterization of coal particles using rule base on-line image analysis: [Quarterly] technical report, December 1, 1993–February 28, 1994.** Yen, S.C.M. (Southern Illinois Univ., Carbondale, IL (United States)); Chu, T.C. Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-92PC92521. Order Number DE94012578. Source: OSTI; NTIS; GPO Dep.

Different materials in coal reflect light in a different manner and, therefore, can be identified based on their image of light reflectance characteristics (i.e. shade of gray). Furthermore, liberated and nonliberated pyrite particles are surrounded by media of different shades of gray. With these two pieces of information, the degree of pyrite liberation and the degree of purity of coal macerals can be analyzed through a computer program. Ultimately, this image analysis computer program will acquire and analyze different frames of coal image automatically without any intervention of an operator. During the past one year, an in-depth database of the light reflectance characteristics of different materials of coal has been established. This process is still being continued to extend the database of coal images. During this quarter, a C-language computer program has been developed. This program reads an image and analyzes it according to the database and decision-making criteria developed in the previous study. Thus far this computer program tends to account more particles than what are presented in an image. This is attributed to the electronic noise produced through the CCD camera. The electronic noises are in the order of 1 or two pixels and can be rectified through an additional decision-making rule. In general, this computer program picked up the particles without any intervention from an operator. In other words, this computer can replace an operator to perform the analysis of ultafine coal particles.

57 (DOE/PC/92527–T7) **Hindered diffusion of coal liquids: Quarterly report No. 7, March 18, 1994–June 17, 1994.** Tsotsis, T.T. (Univ. of Southern California, Los Angeles, CA (United States). Dept. of Chemical Engineering); Sahimi, M.; Webster, I.A. University of Southern California, Los Angeles, CA (United States). Dept. of Chemical Engineering. [1994]. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92527. Order Number DE95001943. Source: OSTI; NTIS; GPO Dep.

It is the purpose of the project described here to provide a correct concept of the diffusion of coal asphaltenes by careful and detailed investigations of asphaltene transport through porous systems under realistic process temperature and pressure conditions. The experimental studies will be coupled with detailed in-depth statistical and molecular dynamics models intended to provide a fundamental understanding of the overall transport mechanisms.

58 (INIS-mf–14393, pp. 39-40) **Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content.** Starosta, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. COAL/ash content; COAL/iron compounds; COAL/minerals; IRON COMPOUNDS/detection; COAL; MINERALS; DETECTION; MOESSBAUER EFFECT

0108 Waste Management

Refer also to citation(s) 12, 13, 32, 79, 80, 85, 86, 87, 91, 129, 591, 734, 736, 737, 738, 739, 1035, 1762

59 (ANL/ESD–24) **Gasification combined cycle: Carbon dioxide recovery, transport, and disposal.** Doctor, R.D.; Molburg, J.C.; Thimmapuram, P.R.; Berry, G.F.; Livengood, C.D. Argonne National Lab., IL (United States). Sep 1994. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001851. Source: OSTI; NTIS; GPO Dep.

The objective of the project is to develop engineering evaluations of technologies for the capture, use, and disposal of carbon dioxide (CO_2). This project emphasizes CO_2-capture technologies combined with integrated gasification combined-cycle (IGCC) power systems. Complementary evaluations address CO_2 transportation, CO_2 use, and options for the long-term sequestering of unused CO_2. Commercially available CO_2-capture technology is providing a performance and economic baseline against which to compare innovative technologies. The intent is to provide the CO_2 budget, or an "equivalent CO_2" budget, associated with each of the individual energy-cycle steps, in addition to process design capital and operating costs. The value used for the "equivalent CO_2" budget is 1 kg of CO_2 per kilowatt-hour (electric). The base case is a 458-MW IGCC system that uses an air-blown Kellogg-Rust-Westinghouse agglomerating fluidized-bed gasifier, Illinois No. 6 bituminous coal feed, and in-bed sulfur removal. Mining, feed preparation, and conversion result in a net electric power production of 454 MW, with a CO_2 release rate of 0.835 kg/kWhe. Two additional life-cycle energy balances for emerging technologies were considered: (1) high-temperature CO_2 separation with calcium- or magnesium-based sorbents, and (2) ambient-temperature facilitated-transport polymer membranes for acid-gas removal.

60 (DOE/ER/80896–94/C0379) **Ceramem filters for removal of particles from hot gas streams.** Bishop, B.A.; Goldsmith, R.L. CeraMem Corp., Waltham, MA (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER80896. (CONF-9406131–63: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE95001976. Source: OSTI; NTIS; GPO Dep.

The need for hot gas cleanup in the power, advanced coal conversion, process and incineration industries is well documented and extensive development is being undertaken to develop and demonstrate suitable filtration technologies. In general, process conditions include (a) oxidizing or reducing atmospheres, (b) temperatures to 1800°F, (c) pressures to 300 psi, and (d) potentially corrosive components in the gas stream. The most developed technologies entail the use of candle or tube filters, which suffer from fragility, lack of oxidation/corrosion resistance, and high cost. The ceramic membrane filter described below offers the potential to eliminate these limitations.

61 (DOE/ER/81349–94/C0356) **IF&P Fibrosic™ filters.** Eggerstedt, P.M. Industrial Filter and Pump Mfg. Co., Inc., Cicero, IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER81349. (CONF-9406131–64: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE95001975. Source: OSTI; NTIS; GPO Dep.

The primary objective of this SBIR research program is to increase the performance, durability, and corrosion resistance of lightweight filter candles and filter tubesheet components (Fibrosic™), fabricated from vacuum formed chopped ceramic fiber (VFCCF), for use in advanced coal utilization applications. Phase I results proved that significant gains in material strength and particle retentivity are possible by treatment of VFCCF materials with colloidal ceramic oxides. Phase II efforts will show how these treated materials tolerate high temperature and vapor-phase alkali species, on a long-term basis. With good durability and corrosion resistance, high temperature capability, and a low installed and replacement cost, these novel materials will help promote commercial acceptance of ceramic candle filter technology, as well as increase the efficiency and reliability of coal utilization processes in general.

62 (DOE/MC/25185–3301) **Solid waste sampling and distribution project: Sampling report #4.** Energy and Environmental Research Corp., Irvine, CA (United States). Jan 1993. 42p.

Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-88MC25185. Order Number DE95001862. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy (DOE) has established a Waste Management Program within the Office of Fossil Energy. A key goal of this program is to ensure that waste management issues do not become obstacles to the commercialization of advanced coal utilization technologies. In achieving this goal, the Waste Management Program identifies various emerging coal utilization technologies and performs comprehensive characterizations of the waste streams and products. The characterizations include engineering assessments to define waste streams of interest/potential concern, field studies to collect samples of the waste, and complete chemical analysis of the collected samples. The primary objectives of the site selection and sampling effort are as follows. Survey sites at which advanced fossil energy combustion technologies are being operated, and identify five sites for sampling, giving priority to DOE Clean Coal Technology Program Sites. Identify candidate solid waste streams likely to present disposal problems and prioritize them for sampling at selected sites. Contact site personnel for site access, sample the streams representatively and document them according to established methodology and known process conditions. Distribute the samples to DOE's Morgantown Energy Technology Center or their representatives for analysis and report on the site visit. Several technologies have been tentatively selected for comprehensive waste characterization. One of those technologies is the SO_x-NO_x-RO_x Box (SNRB) Flue Gas Cleanup process. On December 16, 1992 samples were collected to characterize solid waste streams. This document provides background information on the site and describes sampling activities performed at this facility.

63 (DOE/MC/28016–94/C0378) **Trace element emissions.** Benson, S.A.; Erickson, T.A.; Steadman, E.N.; Zygarlicke, C.J.; Hauserman, W.B.; Hassett, D.J. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC28016. (CONF-9406131–60: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE95001757. Source: OSTI; NTIS; GPO Dep.

The Energy & Environmental Research Center (EERC) is carrying out an investigation that will provide methods to predict the fate of selected trace elements in integrated gasification combined cycle (IGCC) and integrated gasification fuel cell (IGFC) systems to aid in the development of methods to control the emission of trace elements determined to be air toxics. The goal of this project is to identify the effects of critical chemical and physical transformations associated with trace element behavior in IGCC and IGFC systems. The trace elements included in this project are arsenic, chromium, cadmium, mercury, nickel, selenium, and lead. The research seeks to identify and fill, experimentally and/or theoretically, data gaps that currently exist on the fate and composition of trace elements. The specific objectives are to (1) review the existing literature to identify the type and quantity of trace elements from coal gasification systems, (2) perform laboratory-scale experimentation and computer modeling to enable prediction of trace element emissions, and (3) identify methods to control trace element emissions.

64 (DOE/MC/29261–94/C0377) **Trace species emissions for IGFC.** Pigeaud, A.E.; Helble, J.J. Energy Research Corp., Danbury, CT (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29261. (CONF-9406131–61: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE95001758. Source: OSTI; NTIS; GPO Dep.

The objectives of this investigation are to study both the fate and distribution of at least five significant, coal-derived trace elements commonly present in coal-gas, in terms of their vaporization during gasification, their condensation and sorption during hot-gas cleanup, as well as their effects on fuel cells, gas turbines, and ultimately the environment. The definition here of trace does not include the major contaminants of sulfur and chlorine, etc., although the simultaneous presence of such major species is always considered in our thermochemical calculations. Of course, many other elements can vaporize in trace quantities from raw coal as either volatile, molecular compounds or as metallic vapors which, besides their deleterious action on the energy conversion systems, can also be detrimental to plant and animal life when emitted into the atmosphere. Hence, an understanding is sought of how the type and quantity of significant trace species in coal-gas changes from the coal pile through cleanup subsystems and the electric generators to the exhaust stack of an integrated system.

65 (DOE/MT/92018–3) **Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1993–June 30, 1993.** Akyurtlu, A. Hampton Univ., VA (United States). Dept. of Engineering. Jun 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92MT92018. Order Number DE95002765. Source: OSTI; NTIS; GPO Dep.

Simultaneous removal of SO_2 and NO_x using a regenerable solid sorbent will constitute an important improvement over the use of separate processes for the removal of these two pollutants from stack gases and possibly eliminate several shortcomings of the individual SO_2 and NO_x removal operations. This process will allow simple and reliable cleanup of large volumes of stack gases at a competitive cost; produce a concentrated stream of SO_2 which can easily be converted into valuable by-products; be compatible with existing power generation plants; and essentially eliminate the waste materials generated in some other sulfur removal processes. Recent studies at PETC considered cerium oxide as an alternate sorbent to CuO. Ceria improves the resistance of the alumina support to thermal sintering and produces a regeneration off-gas stream that can be easily converted to elemental sulfur. It has a potentially higher sulfur capture capacity than copper. It is readily available at a moderate cost. Although it is more expensive than copper oxide, since the cost of metal oxide is a small fraction of the total sorbent cost this may not be a significant factor. The objective of this research is to determine the effects of ammonia on the sulfation of the sorbent; to determine the effects of fly ash on the sulfation and regeneration of the sorbent; to obtain a rate expression for the regeneration of alumina-supported CeO_2 sorbents; to model reactor configurations for a commercial scale combined CeO_2/Al_2O_3 sorbent; and to study alternative designs, effects of design variables on the performance of the facility, and the economics of the process using the developed model.

66 (DOE/MT/92018–7) **Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1994–June 30, 1994.** Akyurtlu, A. Hampton Univ., VA (United States). Dept. of Engineering. Jul 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92MT92018. Order Number DE95002764. Source: OSTI; NTIS; GPO Dep.

Simultaneous removal of SO_2 and NO_x using a regenerable solid sorbent will constitute an important improvement over the use of separate processes for the removal of these two pollutants from stack gases and possibly eliminate several shortcomings of the individual SO_2 and NO_x removal operations. This process will allow simple and reliable cleanup of large volumes of stack gases at a competitive cost; produce a concentrated stream of SO_2 which can easily be converted into valuable by-products; be compatible with existing power generation plants; and essentially eliminate the waste materials generated in some other sulfur removal processes. Department of Energy's Pittsburgh Energy Technology Center (PETC) and UOP/Shell have developed processes which both employ copper oxide-based sorbents in different reactor configurations. More recent studies at PETC considered cerium oxide as an alternate sorbent to CuO. Ceria improves the resistance of the alumina support to thermal sintering and produces a regeneration off-gas stream that can be easily converted to elemental sulfur. It has a potentially higher sulfur capture capacity than copper. It is readily available at a moderate cost. Although it is more expensive than copper oxide, since the cost of metal oxide is a small fraction of the total sorbent cost this may not be a significant factor. The objective of this research is to determine the effects of ammonia on the sulfation of the sorbent; to determine the effects of fly ash on

the sulfation and regeneration of the sorbent; to obtain a rate expression for the regeneration of alumina-supported CeO_2 sorbents; to model reactor configurations for a commercial scale combined CeO_2/Al_2O_3 sorbent; and to study alternative designs, effects of design variables on the performance of the facility, and the economics of the process using the developed model.

67 (DOE/PC/90548–T13) **LIFAC Sorbent Injection Desulfurization Demonstration Project: Quarterly report number 14, January–March, 1994.** LIFAC North America, Inc., Pittsburgh, PA (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-91PC90548. Order Number DE95001952. Source: OSTI; NTIS; GPO Dep.

The host site for the $22 million, three-phase project is Richmond Power and Light's Whitewater Valley Unit No. 2 in Richmond, Indiana. The LIFAC technology uses upper-furnace limestone injection with patented humidification of the flue gas to remove 75–85% of the sulfur dioxide (SO_2) in the flue gas. During this report period (January–March 1994), long-term testing was initiated. The variable frequency drive was placed back in service, but failed again after only a few days of operation. The Unit No. 2 induced draft (ID) fan motor operates at maximum amperage during peak (65 MW) boiler load. LIFAC increases system pressure drop approximately 4.5 inches of water, causing additional loading on the fan motor. A variable frequency drive (VFD) was installed as a major component of the LIFAC system. The VFD interfaces with the ID fan motor by varying motor current as the pressure drop and flue gas volume change, making the fan more efficient and decreasing the stress on the motor. The VFD has failed several times causing boiler Unit No. 2 to trip. Since the VFD has become unreliable, the LIFAC team decided to perform a test on the ID fan motor with the bypass damper fully closed and the VFD disengaged. The objective of long-term testing is to evaluate the performance and operability of the LIFAC process over a long, continuous operation period. There were a total of two test periods during this quarter. Results are presented.

68 (DOE/PC/93214–T4) **Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994.** Kawatra, S.K.; Eisele, T.C.; Shoop, K. Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering. Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93214. Order Number DE95002427. Source: OSTI; NTIS; GPO Dep.

This project is studying the characteristics of flue-gas scrubber sludges from several sources. This will facilitate the development of purification technologies which will make it possible to directly utilize scrubber sludges rather than landfilling them This purification will consist of minimal-reagent froth flotation, using the surface properties of the particles of unreacted limestone to remove them and their associated impurities from the material, leaving a purified calcium sulfite/gypsum product. The objectives of this project are to: Investigate properties of scrubber sludge that will control its behavior in separation processes, and determine how the surface properties of the sludge particles change as the conditions in solution change; examine the ability of various froth-flotation processes to separate the various components based on differences in their surface chemistry; and determine methods for accomplishing the separation without adding additional chemical hazards to the environment. During the fourth quarter, studies of the Zeta potentials of the individual sludge components were continued. These measurements are initially being made on chemically pure calcium sulfite, calcium carbonate, and gypsum, to establish a baseline for comparison for the actual sludge samples. These measurements are being used to determine the solution conditions that produce the greatest differences in the surface properties of the various types of particles in the sludge, and which will therefore produce the sharpest possible flotation separation. The details of these studies are presented in the following sections.

69 (DOE/PC/93227–T3) **Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994.** Chen, Wei-Yin (Univ. of Mississippi, University, MS (United States). Dept. of Chemical Engineering); Ma, Long; Fan, L.T.; Yashima, Mutsuo. Mississippi Univ., University, MS (United States). Dept. of Chemical Engineering. [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93227. Order Number DE95002632. Source: OSTI; NTIS; GPO Dep.

It has been discovered that nitrogen oxide can be effectively reduced over lignite char surface during one of the staging combustion process named "reburning". Our work is aimed at a better understanding of the chemical and physical mechanisms in the reburning with chars. Specifically, char gasification and ash catalyzed CO+NO reaction rates will be measured. Research in the second quarter has focused on the modification of the coal feeder, design and fabrication of a new char/ash collector, and char surface area measurement. With these improvements in the coal feeder and ash collector, experiments are performed with greater accuracy and efficiency. The operation of the BET surface area analyzer (Micromeritics model, Flowsorb 2300) necessary for determining the fractal dimension of char surface has been stabilized with respect to various operating parameters. The instrument has been set up to measure the surface areas of coal chars with molecules of nitrogen serving as the adsorbate at the temperature of liquid nitrogen (-195°C). Some auxiliary equipment and materials have been purchased without cost to DOE to facilitate the operation, calibration, and measurement.

70 (ETDE/DE-mf–95716303) **Microbial transformation of inorganic and organic sulphur compounds.** Worbs, M.; Aurich, A.; Ebert, S.; Seidel, K.; Wiessner, A. Institut fuer Biotechnologie, Leipzig (Germany). [1992]. 14p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0319716A. Order Number DE95716303. Source: OSTI; NTIS (US Sales Only).

Fundamental studies were carried out in anaerobic conditions on inorganic and organic sulphur compounds, in consideration of reduction processes. Experiments on archaebacteria showed that some specially adopted cultures grow on brown coal, but these cultures - which were tested in cooperation with Regensburg University are not suited for desulphurisation of coal. Mixed cultures containing sulfate-reducing bacteria were obtained from contaminated media, and a pure culture of desulfovibris desulfuricans was isloated by selection. Another culture not yet available as a pure culture may be a strain of Desulfortomaculum. Investigations of growth and sulfate reduction characteristics of the mixed culture containing Desulfovibiro showed pH-displaced peaks for bacterial growth and sulfate reduction. At pH values between 7.3 and 8.3, a stable fraction of sulfate-reducing bacteria is found in the mixed culture. Further investigations will be required for defining potential fields of application. (orig.)

71 (IS-M–804) **Chloride and mercury monitors for air toxics measurements.** Buttermore, W.H.; Norton, G.A.; Chriswell, C.D.; Eckels, D.E.; Peters, R.E. Ames Lab., IA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9406131–57: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE94012300. Source: OSTI; NTIS; GPO Dep.

Ames laboratory will develop an integrated sampling and analysis system suitable for on-line monitoring of hydrogen chloride (HCl) and mercury (Hg) in advanced coal gasifiers. The objectives of this project are to (1) summarize current technology for monitoring HCl and Hg in gaseous effluents, (2) identify analytical techniques for such determinations in high-temperature, high-pressure gases from coal-based systems of interest to METC for producing electrical power, (3) evaluate promising analytical approaches, and (4) produce reliable on-line monitors which are adaptable to plant-scale diagnostics and process control.

0109 Environmental Aspects

Refer also to citation(s) 8, 79, 729

0120 Mining

72 (ETDE/DE-mf–95707742) **Development of an optics-based method for reducing mine-stone content of run-of-mine**

coal: Final report. Mueller, H. Ruhrkohle AG, Essen (Germany). Jul 1994. 202p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT .0326483B. Order Number DE95707742. Source: OSTI; NTIS (US Sales Only).

For reducing unwanted cutting by coal ploughs into adjacent strata, a novel Gleithobel (coal plough design) capable of identifying the coal/stone interface by means of an optical sensor was developed in cooperation with Battelle Institut and Westfalia Becorit. The sensor is integrated into the plough body and is, during plough travel, in fricitional contact with the floor in the trace of cut of the floor pick. The sensor identifies the coal/stone interface by the coal's and the stone's different infrared (generated by an infrared light source) reflection. An electronic evaluation unit processes the measured values and controls the plough's floor pick accordingly along the coal/stone interface. The prototype of the sensor controlled plough was tested comprehensively on a mock-up coal face prior to underground trials. (orig.)

73 (ETDE/DE-mf–95707779) **Development and testing of a salvaging manipulator for yielding arch-support underground: Final report.** Piwellek, H. Ruhrkohle Bergbau AG, Herne (Germany). Jun 1994. 111p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01HD097A; Foerderkennzeichen BMFT 032648 Order Number DE95707779. Source: OSTI; NTIS (US Sales Only).

For salvaging yielding-arch support underground the concept for a salvaging manipulator was drafted with the aim of increasing safety when salvaging yielding arch support units, for reducing physical work of the slavaging crew, and for increasing cost effektiveness by higher salvaging performance. Based on a performance specifications, one proposal was selected out of 6 designs, and subsequently constructed in the course of the project's main phase. The unit underwent surface testing and then was tested underground on Rheinland colliery. During the underground trials the joy-stick control for the manipulator arm turned out to be very complicated and time-consuming. For better handling and cost-effectiveness, the salvaging manipulator should be equiped with a master-slave control if said control's tests within another R+D project of Ruhrkohle AG yields good results. When testing it was found, that inspite of good handlability, this technology is to be regarded at present as still too complicated for underground use in hardcoal mining. Eventually, a robot control for the salvaging manipulator was tested in a computer simulation. (orig.)

74 (ETDE/DE-mf–95707780) **Joint project 'Mining': Transport and assembly aids underground: Final report.** Piwellek, H. Ruhrkohle Bergbau AG, Herne (Germany). Jun 1994. 168p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01HD097A. Order Number DE95707780. Source: OSTI; NTIS (US Sales Only).

The difficult working conditions underground in the field of transport and assembly of equipment require new ways of thinking about the minder's working place according to humanitarian criteria. Based on the results of the preliminary phase, a monorail-fitted manipulator and a floor-bound manipulator with a novel electro-hydraulic master-salve control with permanent magnet was constructed in the course of the main phase. The floor-bound manipulator was subsequently tested by DMT-Gesellschaft fuer Forschung und Pruefung mbH in view of underground use. The DMT tests have shown that the prototype is capable of handling safely loads of up to 600 kg, with a high degree of stability and sufficiant precision of positioning assured by the masters slave control. However, due to the large dimension of the heavy undercarriage the application range is strongly limited, and for trial operations underground i.a. further safety-relevant improvements are still necessary. For time reasons the trial operation of the monorail-bound manipulator could not be carried out within the time schedule of the project. (orig.)@@

75 (ETDE/DE-mf–95711746) **Cost optimization of mine design by means of filled stoping: Final report.** Eisenbart, J. (comp.); Papenfuss, G. (comp.). Technische Univ. Clausthal, Clausthal-Zellerfeld (Germany). Inst. fuer Bergbaukunde und Bergwirtschaftslehre. Oct 1992. 237p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326526E. Order Number DE95711746. Source: OSTI; NTIS (US Sales Only).

The research project had two related intentions: First, the description and analysis of the effects of filled stoping on mine layout and operation; secondly, on the basis of these investigations, an analysis of the contribution of high-quality filled stoping on cost-optimized mine design in consideration of all related factors. (orig.)

76 (ETDE/DE-mf–95716308) **Improvement of working conditions in black coal mines by prevention of gas eruptions and by protection of miners in case of gas eruptions: Final report.** Preussag Anthrazit GmbH, Ibbenbueren (Germany). Apr 1991. 151p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01HD114. Order Number DE95716308. Source: OSTI; NTIS (US Sales Only).

The project comprises pressure measurements for preliminary coal seam prospection; application of geophysical methods and of other methods for the early detection of coal seam sections which are susceptible to gas eruptions; studies of the effectiveness of optimum borehole diameters with respect to stress relief drilling; protection of miners from gas and coal eruption hazards; improvements in measured-value acquisition. (orig.)

77 (ETDE/DE-mf–95716317) **Reduction of health-effecting ultra-fine dusts by automatically controlled water addition during the application of dry construction materials. Main phase: Final report.** Urbainczyk, W. Ruhrkohle Niederrhein AG/Ruhrkohle Westfalen AG, Herne (Germany). Sep 1993. 82p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01HD058A. (RAG–00430100). Order Number DE95716317. Source: OSTI; NTIS (US Sales Only).

The increasing use of pneumatic dry construction materials in the mining industry goes along with an aggravation of ultra-fine dust load at work places. The design of an automatic control of water addition during the pneumatic introduction of said construction materials is to largely exclude health hazards of the workforce by ultra-fine dust make. Based on the results of the preliminary phase (01-HD-046/4) two manufacturers built one prototype each of an automatic water spray system which were subjected to rig tests at DeutscheMontanTechnologie (DMT). The subsequent underground trial was run on one prototype only. DMT tests on the 2nd prototype revealed substantial deficiencies, in particular high wear of the mesuring equipment. Unterground trials on the first prototype yielded, after some modifications, by and large encouraging results as to dust make and handling properties. (orig.). 20 figs.

0130 Transport, Handling, and Storage

Refer also to citation(s) 1671

78 (DOE/PC/91297–T7) **A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994.** Ahmadi, G. Clarkson Univ., Potsdam, NY (United States). Dept. of Mechanical and Aeronautical Engineering. [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91297. Order Number DE95002627. Source: OSTI; NTIS; GPO Dep.

In the period of June 1, 1994 to August 31, 1994, further progress was made in the analysis of granular materials in ducts and passages with bumpy walls. The Couette flow case was completed and significant new results for the gravity chute flows were obtained. The results were compared with the experimental data and earlier simulation results and good agreement was observed. Additional results on the flows of gas-solid mixtures in vertical ducts were obtained. The earlier developed computational model for analyzing two-phase flow was used, and the phasic flow properties were evaluated. The results were compared with the experimental data of Tsuji an co-worker and good agreement was obtained. The case of two-phase flows in a horizontal duct is studied. The experimental study of mono-granular layer simple shear flow device was

completed. A detail set of experimental data for the mean granular velocity, fluctuation velocity and solid volume fraction were obtained. The experimental study clearly show the importance of fluctuation energy components on dynamics of particulate flows.

0140 Combustion

Refer also to citation(s) 55, 67, 69, 1007, 1177, 1423, 1490, 1491, 1492, 1493

79 (CONF-940442–) **Management of high sulfur coal combustion residues, issues and practices: Proceedings.** Chugh, Y.P.; Beasley, G.A. (eds.). Southern Illinois Univ., Carbondale, IL (United States). [1994]. 293p. Sponsored by USDOE, Washington, DC (United States);Illinois Clean Coal Inst., Carterville, IL (United States);Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States);Illinois Coal Association, IL (United States). From Conference on the management of high sulfur coal combustion residues: issues and practices; Springfield, IL (United States); 5-7 Apr 1994. Order Number DE95001292. Source: OSTI; NTIS; GPO Dep.

Papers presented at the following sessions are included in this proceedings: (1) overview topic; (2) characterization of coal combustion residues; (3) environmental impacts of residues management; (4) materials handling and utilization, Part I; and (5) materials handling and utilization, Part II. Selected paper have been processed separately for inclusion in the Energy Science and Technology Database.

80 (CONF-9409160–1) **500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide emissions from coal-fired boilers.** Sorge, J.N.; Wilson, S.M. Southern Co. Services, Inc., Birmingham, AL (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-90PC89651. From 3. annual clean coal technology conference; Chicago, IL (United States); 6-8 Sep 1994. Order Number DE95001969. Source: OSTI; NTIS; GPO Dep.

This paper discusses the technical progress of a US Department of Energy Innovative Clean Coal Technology project demonstrating advanced wall-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers. The primary objective of the demonstration is to determine the long-term NOx reduction performance of advanced overfire air (AOFA), low NOx burners (LNB), and advanced digital control/optimization methodologies applied in a stepwise fashion to a 500 MW boiler. The focus of this paper is to (1) present final results from the AOFA, LNB, and LNB + AOFA test phases and (2) provide an overview of the advanced digital control/optimization methods scheduled for demonstration starting fall 1994. Results from various LNB and AOFA testing and optimization efforts over a four year period provided a progressive improvement in emissions performance as operating and technical familiarity increased.

81 (DOE/MC/23166–3833) **Advanced coal-fueled industrial cogeneration gas turbine system – combustion development.** LeCren, R.T. Solar Turbines, Inc., San Diego, CA (United States). Jun 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC23166. Order Number DE94012267. Source: OSTI; NTIS; GPO Dep.

This topical report summarizes the combustor development work accomplished under the subject contract. The objective was to develop a combustion system for the Solar 4MW Type H Centaur gas turbine generator set which was to be used to demonstrate the economic, technical and environmental feasibility of a direct coal-fueled gas turbine in a 100 hour proof-of-concept test. This program started with a design configuration derived during the CSC program. The design went through the following evolution: CSC design which had some known shortcomings, redesigned CSC now designated as the Two Stage Slagging Combustor (TSSC), improved TSSC with the PRIS evaluated in the IBSTF, and full scale design. Supporting and complimentary activities included computer modelling, flow visualization, slag removal, SO_x removal, fuel injector development and fuel properties evaluation. Three combustor rigs were utilized: the TSSC, the IBSTF and the full scale rig at Peoria. The TSSC rig, which was 1/10th scale of the proposed system, consisted of a primary and secondary zone and was used to develop the primary zone performance and to evaluate SO_x and slag removal and fuel properties variations. The IBSTF rig which included all the components of the proposed system was also 1/10th scale except for the particulate removal system which was about 1/30th scale. This rig was used to verify combustor performance data obtained on the TSSC and to develop the PRIS and the particulate removal system. The full scale rig initially included the primary and secondary zones and was later modified to incorporate the PRIS. The purpose of the full scale testing was to verify the scale up calculations and to provide a combustion system for the proof-of-concept engine test that was initially planned in the program.

82 (DOE/MC/23166–3869) **Advanced coal-fueled industrial cogeneration gas turbine system particle removal system development.** Stephenson, M. Solar Turbines, Inc., San Diego, CA (United States). Mar 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-86MC23166. Order Number DE94012294. Source: OSTI; NTIS; GPO Dep.

Solar Turbines developed a direct coal-fueled turbine system (DCFT) and tested each component in subscale facilities and the combustion system was tested at full-scale. The combustion system was comprised of a two-stage slagging combustor with an impact separator between the two combustors. Greater than 90 percent of the native ash in the coal was removed as liquid slag with this system. In the first combustor, coal water slurry mixture (CWM) was injected into a combustion chamber which was operated loan to suppress NO_x formation. The slurry was introduced through four fuel injectors that created a toroidal vortex because of the combustor geometry and angle of orientation of the injectors. The liquid slag that was formed was directed downward toward an impaction plate made of a refractory material. Sixty to seventy percent of the coal-borne ash was collected in this fashion. An impact separator was used to remove additional slag that had escaped the primary combustor. The combined particulate collection efficiency from both combustors was above 95 percent. Unfortunately, a great deal of the original sulfur from the coal still remained in the gas stream and needed to be separated. To accomplish this, dolomite or hydrated lime were injected in the secondary combustor to react with the sulfur dioxide and form calcium sulfite and sulfates. This solution for the sulfur problem increased the dust concentrations to as much as 6000 ppmw. A downstream particulate control system was required, and one that could operate at 150 psia, 1850-1900°F and with low pressure drop. Solar designed and tested a particulate rejection system to remove essentially all particulate from the high temperature, high pressure gas stream. A thorough research and development program was aimed at identifying candidate technologies and testing them with Solar's coal-fired system. This topical report summarizes these activities over a period beginning in 1987 and ending in 1992.

83 (DOE/MC/26008–3769) **High-pressure coal-fired ceramic air heater for gas turbine applications: Technical progress report for month of January 1994.** Hague International, South Portland, ME (United States). [1994]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC26008. Order Number DE95002463. Source: OSTI; NTIS; GPO Dep.

Design Review meeting was held at the Kennebunk Test Facility between DOE-METC and Hague International on January 24 and 25, 1994. The designs of the coal combustor, slag screen and CerHx were reviewed with the assistance of a number of technical consultants. A list of those attending is enclosed. Additional DOE-METC support in the areas of numerical analysis and instrumentation were discussed. A separate controls and instrumentation review meeting is to be held in February. DOE-METC has been using the "Fluent" code to model the coal combustor. Some preliminary results were reviewed at the meeting. Efforts to model the combustor will continue. DOE-METC will be exploring the possibility of using Brigham Young University's coal combustion code. The slag screen is another area in which DOE-METC would be able to provide support. This includes some numerical modeling and diagnostics. DOE-METC would be providing the capability of particle

size distribution measurements upstream and downstream of the slag screen.

84 (DOE/PC/89651–T14) **500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide (NO_x) emissions from coal-fired boilers: Technical progress report, fourth quarter 1993.** Southern Co. Services, Inc., Birmingham, AL (United States). [1994]. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-90PC89651. Order Number DE95001956. Source: OSTI; NTIS; GPO Dep.

This quarterly report discusses the technical progress of an Innovative Clean Coal Technology (ICCT) demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide (NO_x) emissions from coal-fired boilers. The project is being conducted at Georgia Power Company's Plant Hammond Unit 4 located near Rome, Georgia. The primary goal of this project is the characterization of the low NO_x combustion equipment through the collection and analysis of long-term emissions data. A target of achieving fifty percent NO_x reduction using combustion modifications has been established for the project. The project provides a stepwise retrofit of an advanced overfire air (AOFA) system followed by low NO_x burners (LNB). During each test phase of the project, diagnostic, performance, long-term, and verification testing will be performed. These tests are used to quantify the NO_x reductions of each technology and evaluate the effects of those reductions on other combustion parameters.

85 (DOE/PC/89653–T15) **180 MW demonstration of advanced tangentially-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers: Technical progress report, First quarter 1991.** Southern Co. Services, Inc., Birmingham, AL (United States). [1991]. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-90PC89653. Order Number DE95001935. Source: OSTI; NTIS; GPO Dep.

This project is being conducted at Gulf Power Company's Plant Lansing Smith Unit 2 (LS-2) located near Panama City, Florida. The primary objective of this demonstration is to determine the long-term effects of commercially available tangentially-fired low NOx combustion technologies on NOx emissions and boiler performance. The stepwise approach that is being used to evaluate the NOx control technologies requires three plant outages to successively install the test instrumentation and the different levels of the low NOx concentric firing system (LNCFS). Following each outage, a series of four groups of tests are performed. These are (1) diagnostic, (2) performance, (3) long-term, and (4) verification. These tests are used to quantify the NOx reductions of each technology and evaluate the effects of those reductions on other combustion parameters such as particulate characteristics and boiler efficiency. This quarterly update provides a description of the flow modeling study. This modeling effort centers on evaluating the in-furnace flow and mixing phenomena for the various low NOx firing systems being demonstrated at LS-2. Testing on the 1/12 scale model of the LS-2 boiler and the 1/6 scale model of the overfire air ductwork was completed. The test matrix included an analysis of the overfire air ductwork and three different boiler configurations. This report also contains results from the Phase 1 baseline tests. Data from the diagnostic, performance, and verification tests are presented. In addition, NOx emissions data and unit load profiles collected during long-term testing are reported. At the full load condition, the baseline NOx emission level at LS-2 is 0.62 lb/mBtu.

86 (DOE/PC/89653–T16) **180 MW demonstration of advanced tangentially-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers: Technical progress report, Third quarter 1992.** Southern Co. Services, Inc., Birmingham, AL (United States). [1992]. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-90PC89653. Order Number DE95001936. Source: OSTI; NTIS; GPO Dep.

The project is being conducted at Gulf Power Company's Plant Lansing Smith Unit 2 located near Panama City, Florida. The primary objective of this demonstration is to determine the long-term effects of commercially available tangentially-fired low NOx combustion technologies on NOx emissions and boiler performance. A target of achieving 50% NOx reduction using combustion modifications has been established for the project. The stepwise approach that is being used to evaluate the NOx control technologies requires three plant outages to successively install the test instrumentation and the different levels of the low NOx concentric firing system (LNCFS). Following each outage, a series of four groups of tests are performed. These are (1) diagnostic, (2) performance, (3) long-term, and (4) verification. These tests are used to quantify the NOx reductions of each technology and evaluate the effects of those reductions on other combustion parameters such as particulate characteristics and boiler efficiency. This technical progress report presents the LNCFS Level 1 long-term data collected during this quarter. In addition, a comparison of all the long-term emissions data that have been collected to date is included.

87 (DOE/PC/89769–T17) **Predictive models of circulating fluidized bed combustors: 14th Technical progress report.** Gidaspow, D. (Illinois Institute of Technology, Chicago, IL (United States). Dept. of Chemical Engineering); Therdthianwong, A. Illinois Inst. of Tech., Chicago, IL (United States). Dept. of Chemical Engineering. Feb 1993. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89PC89769. Order Number DE95001958. Source: OSTI; NTIS; GPO Dep.

The overall objective of this investigation is to develop experimentally verified models for circulating fluidized bed (CFB) combustors. Sorption of SO_2 with calcined limestone was studied in a PYROFLOW type CFB loop at conditions approximating those found in a CFB combustor. Initially the CFB loop contained 150 micron CaO particles of a density of 3.3 g/CM^3 and air at 1143°K and 3.25 atm. At zero time, air containing 600 ppm SO_2 was introduced into the riser bottom at 1143°K. The effect of gas velocity, sorbent inventory and inlet pressure on the sorption of SO_2 were studied isothermally by running hydrodynamic code with the SO_2 sorption conservation of species equation. At a velocity of 5m/sec., reported to be a typical velocity by PYROPOWER, there is reasonably good SO_2 removal. At 10 m/sec the SO_2 removal is poor. The best SO_2 removal is for a velocity of 5 m/s and a high bed inventory, initial bed height, H = 9m. Most of the SO_2 is removed in the first two meters of the reactor. However, the SO_2 removal is not complete at the bed outlet due to mixing. At the left wall of the reactor (wall opposite the solids inlet) the SO_2 removal was poor due to gas bypassing caused by the asymmetrical solids inlet. Simulation of the PYROPOWER loop with a symmetrical inlet gave us an order of magnitude improvement over the conventional PYROPOWER system.

88 (DOE/PC/91160–T3) **Development and testing of a high efficiency advanced coal combustor: Phase III Industrial boiler retrofit: Quarterly technical progress report number 10, January 1–March 31, 1994.** Jennings, P. (ABB/Combustion Engineering, Windsor, CT (United States). Power Plant Labs.); Borio, R.; Scaroni, A.W.; Miller, B.G.; McGowan, J.G. ABB Combustion Engineering, Windsor, CT (United States). Power Plant Labs. 18 May 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-91PC91160. Order Number DE95001953. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to retrofit the previously developed High Efficiency Advanced Coal Combustor (HEACC) to a standard gas/oil designed industrial boiler to assess the technical and economic viability of displacing premium fuels with microfine coal. During this quarter, there were two primary objectives of the program; obtain steady state operation consistently on coal only and increase the carbon conversion efficiency from 95% to the project goal of 98%. After several hardware configurations were tried, a solution to the coal maldistributions in the burner was found. In addition, hardware modifications were made to the piping between the mill and transfer fan to allow operation at design primary air flows without slugging problems. During March coal only operation occurred on 10 out of 10 days when operation on coal only was attempted. The burner is stable and readily controlled. The 400-hour test portion of the program was supposed to be completed by the end of this quarter, however, due to the weather related problems of January and February and the promising results beginning in March, the decision was made to extend this testing until the end of April. This testing was designed to obtain

both economic and technical data for analysis prior to committing to the long term demonstration and also to show that consistent, reliable operation could be achieved as another prerequisite to the demonstration. The objective of April testing will be to increase the carbon conversion efficiency from the best to date of 96% to the project goal of 98%, to test a second coal source and to conduct day to day operation. In addition, a matrix of test points will be conducted to fully characterize the burner.

89 (DOE/PC/91308–10) **Particulate behavior in a controlled-profile pulverized coal-fired reactor: A study of coupled turbulent particle dispersion and thermal radiation transport: Quarterly technical progress report, December 15, 1993–March 14, 1994.** Queiroz, M.; Webb, B.W. Brigham Young Univ., Provo, UT (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-91PC91308. Order Number DE94012615. Source: OSTI; NTIS; GPO Dep.

During the tenth quarter progress has been made in the following areas: (1) Reduction of experimental data recently collected; (2) particle dispersion and radiation modelling.

90 (DOE/PC/92542–T7) **Robotic weld overlay coatings for erosion control.** Lehigh Univ., Bethlehem, PA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92542. Order Number DE95002624. Source: OSTI; NTIS; GPO Dep.

The erosion of materials by the impact of solid particles has received increasing attention during the past twenty years. Recently, research has been initiated with the event of advanced coal conversion processes in which erosion plays an important role. The resulting damage, termed Solid Particle Erosion (SPE), is of concern primarily because of the significantly increased operating costs which result in material failures. Reduced power plant efficiency due to solid particle erosion of boiler tubes and waterfalls has led to various methods to combat SPE. One method is to apply coatings to the components subjected to erosive environments. Protective weld overlay coatings are particularly advantageous in terms of coating quality. The weld overlay coatings are essentially immune to spallation due to a strong metallurgical bond with the substrate material. By using powder mixtures, multiple alloys can be mixed in order to achieve the best performance in an erosive environment. However, a review of the literature revealed a lack of information on weld overlay coating performance in erosive environments which makes the selection of weld overlay alloys a difficult task. The objective of this project is to determine the effects of weld overlay coating composition and microstructure on erosion resistance. These results will lead to a better understanding of erosion mitigation in CFB's.

91 (DOE/PC/94118–T1) **Automated boiler combustion controls for emission reduction and efficiency improvement: Quarterly progress report, February 14, 1994–May 14, 1994.** Myers, J. (Pennsylvania State Univ., University Park, PA (United States). Penn State Facilities Engineering Institution); West, J.S. Control Techtronics, Inc., Harrisburg, PA (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94PC94118. Order Number DE95002629. Source: OSTI; NTIS; GPO Dep.

Control Techtronics, Inc. (CTI), is conducting a project to reduce air emissions and increase efficiency in coal-fired boilers in Krakow, Poland, and to create a commercial venture in Poland which can act as a leader for efficient combustion in boilers throughout the region. To achieve the technical goals of the project, CTI will use a three-part program as follows: (1) Analyze the fuel specifications of a given plant and recommend modifications, as necessary. (2) Apply automatic combustion controls systems to the boilers. (3) Train plant operators in proper plant operation, as well as proper use of control systems. To achieve the commercial goals, CTI will form a commercial venture in Poland to market and service the CTI program after successful demonstration. In Budget Period One (first year), CTI will demonstrate the efficiency improvement program at MPEC's Balicka district heating plant in the Widok section of Krakow. CTI is working with several organizations to accomplish this work. The Pennsylvania State University (PSU) is providing technical assistance in analysis of the fuel quality, technical assistance in the application of the controls, training material and techniques, and project management assistance. The Polytechnika Krakowska (PK) is working with PSU to conduct performance tests on the boilers at Balicka and to conduct training in the Polish language. Naftokrak-Naftobudowa (NK) is the installing contractor. Energoaparatura (ENAP) will assemble system components in Poland for CTI. MPEC is the owner of the host site for the first CTI installation. CTI is also cooperating with Honeywell, another participant in the DOE/Krakow program, to interface CTI combustion controls with Honeywell system heating controls in the Widok district.

92 (NEI-DK–1664) **Mathematical models and parameter study of a burning coal particle.** Energiministeriets Forskningsudvalg for produktion og fordeling af el og varme. Braendsler og forbraendingsteknik. Biede, O. Danmarks Tekniske Univ., Lyngby (Denmark). Lab. for Varme- og Klimateknik. Jun 1994. 105p. Contract ENS-1323/93-0011. Order Number DE95707342. Source: OSTI; NTIS.

EFP-93.

This report describes the mathematical models used for the pulverized-coal combustion process in the computer code Fyrsys to predict the distribution of temperatures and species concentrations in pulverized-coal combustors. This study includes the mathematical models used for the particle heat-balance, the devolatilization and the char combustion. A systematic sensitivity study including 46 cases was made on coal parameters, sub-models and ambient conditions in order to study the influence on devolatilization and char burn-out times using the sub-model included in Fyrsys for devolatilization and char burn-out. The phenomena included are particle size, gas temperature, oxygen content in the gas, ambient wall temperature, coal type, char reactivity parameters, devolatilization parameters and models, particle emissivity, Nusselt number, blowing factors, thermal inertia, heat produced by carbon conversion at the particle surface and heat loss during devolatilization. As a conclusion, a ranking of the relative importance of each phenomenon on devolatilization time and char burn-out time is given. The physical phenomena particle size, gas temperature, oxygen content in gas and coal type are shown to have a major impact on char burn-out times, while the numerical phenomena have less influence. The predicted devolatilization time is very much influenced by particle size and devolatilization model and parameters. (au)

0150 Economic, Industrial, and Business Aspects

Refer also to citation(s) 982

93 (ETDE/JP-mf–95714825) **Lectures on the Pacific rim region Coal Workshop 1993.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 97p. (In Japanese). Order Number DE95714825. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The present document is a collection of the lectures delivered in the Pacific rim region Coal Workshop 1993. The participating countries were Japan, the Philippines, Korea, Taiwan, China, Thailand, Malaysia and Canada. All of those countries delivered lectures reflecting their respective national situations. In 1990, the coal importation to Asian region was 180 million tons (70 million tons for the power generation use), 50% of which were from Australia. The other 50% were from Canada and USA. China annually produces coal of 1.1 billion tons, most of which are domestically consumed. Supported by Asian development in economy, the coal importation for the power generation use in 2000 will be over twice as large as that in 1990. However depending upon the trend of market, development of new coal mines and quantitative availability to exportation in Australia and other coal-exporting countries, shortage is predicted of 30 to 60 million tons in 2000. As a matter of course, concord is needed between both coal exporting and importing countries to stabilize the coal supply and demand. Trinitarian measures covering the economic growth, energy preservation and environmental preservation on the global scale are important because the coal largely influences the environment. 13 figs., 43 tabs.

0160 Health and Safety

Refer also to citation(s) 76, 77

02 PETROLEUM

Refer also to citation(s) 927

94 (ETDE/DE-mf–95716230) **Institute for Petroleum Research. Annual report 1991.** Institut fuer Erdoelforschung, Clausthal-Zellerfeld (Germany). 1992. 104p. (In German). Order Number DE95716230. Source: OSTI; NTIS (US Sales Only).

The progress report 1991 contains the following complex topics: Improved oil and gas production, the physical-chemical properties of interfaces between oil and water, colloid chemistry of oil, material aspects of the multi-phase transportation of oil, gas and water systems in offshore-pipelines, heavy distillation waste and bitumen, sulphur in oil and environmental analysis related to power stations (the ground, water). (orig./BBR)

0202 Reserves, Geology, and Exploration

Refer also to citation(s) 122

95 (DOE/BC/14653–3) **Innovative techniques for the description of reservoir heterogeneity using tracers: Final report, October 1992–December 1993.** Pope, G.A.; Sepehrnoori, K.; Delshad, M.; Ferreira, L.; Gupta, A.; Maroongroge, V. USDOE Bartlesville Project Office, OK (United States). Nov 1994. 290p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-90BC14653. Order Number DE95000111. Source: OSTI; NTIS; GPO Dep.

This is the final report of a three year research project on the use of tracers for reservoir characterization. The objective of this research was to develop advanced, innovative techniques for the description of reservoir characteristics using both single-well backflow and interwell tracer tests. (1) The authors implemented and validated tracer modeling features in a compositional simulator (UTCOMP). (2) They developed and applied a new single well tracer test for estimating reservoir heterogeneity. (3) They developed and applied a new single well tracer test for estimating reservoir wettability in-situ. (4) They developed a new, simple and efficient method to analyze two well tracer tests based upon type curve matching and illustrated its use with actual field tracer data. (5) They developed a new method for deriving an integrated reservoir description based upon combinatorial optimization schemes. (6) They developed a new, interwell tracer test for reservoir heterogeneity called vertical tracer profiling (VTP) and demonstrated its advantages over conventional interwell tracer testing. (7) They developed a simple and easy analytical method to estimate swept pore volume from interwell tracer data and showed both the theoretical basis for this method and its practical utility. (8) They made numerous enhancements to our compositional reservoir simulator such as including the full permeability tensor, adding faster solvers, improving its speed and robustness and making it easier to use (better I/0) for tracer simulation problems. (9) They applied the enhanced version of UTCOMP to the analysis of interwell tracer data using perfluorocarbons at Elks Hill Naval Petroleum Reserve. All of these accomplishments taken together have significantly improved the state of reservoir tracer technology and have demonstrated that it is a far more powerful and useful tool for quantitative reservoir characterization than previously realized or practiced by the industry.

96 (DOE/BC/14896–3) **Geological and petrophysical characterization of the Ferron Sandstone for 3-D simulation of a fluvial-deltaic reservoir: Quarterly report, April 1, 1994–June 30, 1994.** Allison, M.L. Utah Geological and Mineral Survey, Salt Lake City, UT (United States). 25 Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-93BC14896. Order Number DE95002759. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to develop a comprehensive, interdisciplinary, quantitative characterization of a fluvial-deltaic reservoir which will allow realistic inter-well and reservoir-scale modeling to be developed for improved oil-field development in similar reservoirs world-wide. The geological and petrophysical properties of the Cretaceous Ferron Sandstone in east-central Utah will be quantitatively determined. Both new and existing data will be integrated into a 3-D representation of spatial variations in porosity, storativity, and tensorial rock permeability at a scale appropriate for inter-well to regional-scale reservoir simulation. Results could improve reservoir management through proper infill and extension drilling strategies, reduction of economic risks, increased recovery from existing oil fields, and more reliable reserve calculations. Transfer of the project results to the petroleum industry is an integral component of the project.

97 (DOE/BC/14953–5-Pt.1) **Increased oil production and reserves from improved completion techniques in the Bluebell Field, Uinta Basin, Utah.** Morgan, C.D. Geological Survey, Salt Lake City, UT (United States). [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14953. Order Number DE95002789. Source: OSTI; NTIS; GPO Dep.

This report fulfills one part of a contract deliverable to US DOE. Surface fracturing patterns may provide clues to subsurface fracturing patterns in the Bluebell Oil Field, Uinta Basin, Utah, a field where oil and gas migration is dependent upon fracturing. In addition, structures on fracture surfaces and relationships between fracture sets can provide important information leading to a better understanding of timing and mode of fracture formation. With these ideas in mind the author undertook a study of the surface fractures and their orientations and characteristics in the Bluebell Oil Field.

98 (DOE/BC/14953–5-Pt.2) **Completion history database - selective wells within the Bluebell field, Duchesne and Uintah Counties.** Geological Survey, Salt Lake City, UT (United States). 23 Sep 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14953. Order Number DE95002836. Source: OSTI; NTIS; GPO Dep.

This report is the documentation for selected wells in Utah. This information is from the Utah Geological Survey Integral gim database. The wells are organized by API number.

99 (DOE/BC/14959–10) **Revitalizing a mature oil play: Strategies for finding and producing unrecovered oil in Frio Fluvial-Deltaic reservoirs of South Texas: Technical progress report, July 1, 1994–September 30, 1994.** Tyler, N.; Dutton, S. Texas Univ., Austin, TX (United States). Bureau of Economic Geology. 30 Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14959. Order Number DE95002770. Source: OSTI; NTIS; GPO Dep.

Advanced reservoir characterization techniques are being applied to selected reservoirs in the Frio Fluvial-Deltaic Sandstone (Vicksburg Fault Zone) trend of South Texas in order to maximize the economic producibility of resources in this mature oil play. More than half of the reservoirs in this depositionally complex play have already been abandoned, and large volumes of oil may remain unproduced unless advanced characterization techniques are applied to define untapped, incompletely drained, and new pool reservoirs as suitable targets for near-term recovery methods. This project is developing interwell-scale geological facies models and assessing engineering attributes of Frio fluvial-deltaic reservoirs in selected fields in order to characterize reservoir architecture, flow unit boundaries, and the controls that these characteristics exert on the location and volume of unrecovered mobile and residual oil. The results of these studies will lead directly to the identification of specific opportunities to exploit these heterogeneous reservoirs for incremental recovery by recompletion and strategic infill drilling. Project objectives are divided into three major phases. Phase I, reservoir selection and initial framework characterization, consisted of the initial tasks of screening fields within the play to select representative reservoirs that have a large remaining oil resource and are in danger of premature abandonment and performing initial characterization studies on selected reservoirs to identify the potential in untapped, incompletely drained, and new pool reservoirs. Phase II will involve advanced characterization of selected reservoirs to delineate incremental resource opportunities. The third (III) phase of the project will consist of a series of tasks associated with technology transfer, and the extrapolation of specific results from reservoirs in this study to other heterogeneous fluvial deltaic reservoirs within and beyond the Frio play in South Texas.

100 (DOE/EIA–0208(94-43)) **Weekly petroleum status report: Data for week ended, October 21, 1994.** USDOE Energy Information Administration, Washington, DC (United States). [1994]. 47p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001879. Source: OSTI; NTIS; GPO Dep.

The Weekly Petroleum Status Report (WPSR) provides timely information on the petroleum supply situation in the context of historical information, selected prices, and forecasts. The WPSR is intended to provide up-to-date information to the industry, the press, planners, policymakers, consumers, analysts, and State and local governments. It is published each Thursday by the Energy Information Administration (EIA) and excerpts of the data are available electronically after 9:00 a.m. Wednesday. The data contained in this report are based on company submissions for the week ending 7:00 a.m. the preceding Friday. For some weeks which include holidays, publication of the WPSR is delayed by 1 day. The WPSR is not published during 1 of the last 2 weeks of the year depending upon which day of the week Christmas occurs.

101 (DOE/EIA–0216(93)) **U.S. crude oil, natural gas, and natural gas liquids reserves - 1993 annual report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Oct 1994. 155p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002536. Source: OSTI; NTIS; GPO Dep.

Although new discoveries were up substantially in 1993, US proved reserves of crude oil, natural gas, and natural gas liquids all declined again. Increased gas prices and drilling helped to hold the natural gas reserves decline to 1.6 percent. Oil reserves declined by 3.3 percent. As of December 31, 1993, proved reserves were: Dry natural gas - 162,415 billion cubic feet (excluding gas in underground storage); Crude oil - 22,957 million barrels; Natural gas liquids - 7,222 million barrels (including lease condensate). Proved reserves are those quantities that geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions. Petroleum engineering and geological judgment is required in estimating reserves; therefore, the results are not precise measurements. This report of 1993 US proved reserves of crude oil, natural gas, and natural gas liquids is the 17th in an annual series prepared by the Energy Information Administration (EIA).

102 (DOE/EIA–0538(94/95-2)) **Winter fuels report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. [1994]. 78p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001662. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: Distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD's; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6-10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

103 (DOE/EIA–0538(94/95-3)) **Winter fuels report: Week ending, October 21, 1994.** Zitomer, M.; Griffith, A.; Zyren, J. USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. [1994]. 95p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001872. Source: OSTI; NTIS; GPO Dep.

Demand for distillate fuel oil is expected to show a slight decline this winter (October 1, 1994-March 31, 1995) from last, according to the Energy Information Administration's (EIA) 4th Quarter 1994 Short-Term Energy Outlook (STEO) Mid-World Oil Price Case forecast. EIA projects winter demand to decline one percent to 3.3 million barrels per day, assuming normal weather conditions. The effects of expected moderate growth in the economy and industrial production will likely be offset by much warmer temperatures than those a year ago. EIA projects prices for both residential heating oil and diesel fuel to be moderately higher than prices last winter. Increases are likely, primarily because crude oil prices are expected to be higher than they were a year earlier (Table FE5).

104 (Juel–2909) **Calibration of simulated temperature histories of sedimentary basins.** Leischner, K. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Chemie und Dynamik der Geosphaere 4: Erdoel und Organische Chemie; Bochum Univ. (Germany). May 1994. 309p. (In German). Order Number DE95711383. Source: OSTI; NTIS (US Sales Only).

One of the major problems in simulating the spatial and temporal evolution of a sedimentary basin is the reconstruction and calibration (comparison of measured and calculated data) of the temperature history. In order to improve the calibration of simulated temperature histories several parameters were investigated with respect to their applicability for the calibration of temperature histories among them different maturity parameters like the vitrinite reflectance. As no organic maturity parameter can be converted directly into paleotemperatures other paleothermometers like fluid inclusions and fission tracks in apatite were investigated and the results were then integrated and used in the reconstruction of the temperature histories in four wells from the North-West German Basin using a 1D forward modelling software. Two cells are situated in a part of the basin, where heating rates during the whole geological evolution were relatively low and the maximum burial is achieved recently. On the contrary in the area of the other two wells in the western part of the lower Saxony Basin the thermal regime was strongly influenced by deep-seated intrusions which caused high heating rates during the Mid-Cretaceous. The intrusion of magmatic bodies subsequently was followed by the inversion of the basin. (orig.)

105 (SAND–94-1745C) **Laboratory investigation of constitutive property scaling behavior.** Tidwell, V.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940907–2: Annual technical conference and exhibition of the Society of Petroleum Engineers (SPE), New Orleans, LA (United States), 25-28 Sep 1994). Order Number DE95001627. Source: OSTI; NTIS; INIS; GPO Dep.

Because many constitutive rock properties must be measured at one scale but applied at another, scaling behavior is an issue facing many applied disciplines, including the petroleum industry. A research program has been established to investigate and a quantify scaling behavior through systematic physical experimentation, with the aim of developing and testing models that describe scaling behavior in a quantitative manner. Scaling of constitutive rock properties is investigated through physical experimentation involving the collection of gas-permeability data measured over a range of discrete scales. The approach is to systematically isolate those factors that influence property scaling and investigate their relative contributions to overall scaling behavior. Two blocks of rock, each exhibiting differing heterogeneity structure. have recently been examined. The two samples were found to yield different scaling behavior, as exhibited by changes in the distribution functions and semi-variograms. Simple models have been fit to the measured scaling behavior that are of similar functional form but of different magnitude.

0203 Drilling and Production

Refer also to citation(s) 95, 99, 124

106 (DOE/BC/14431–1-App.) **An evaluation of known remaining oil resources in the United States: Appendix, Project on Advanced Oil Recovery and the States.** Interstate Oil Compact Commission, Oklahoma City, OK (United States). Oct 1994. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89BC14431. Order Number DE95000108. Source: OSTI; NTIS; GPO Dep.

This volume contains appendices for the following: Overview of improved oil recovery methods (enhanced oil recovery methods and advanced secondary recovery methods); Benefits of improved

oil recovery, selected data for the analyzed states; and List of TORIS fields and reservoirs.

107 (DOE/BC/14431–1-Vol.1) **An evaluation of known remaining oil resources in the United States: Project on advanced oil recovery and the states: Volume 1.** Interstate Oil Compact Commission, Oklahoma City, OK (United States). Oct 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89BC14431. Order Number DE95000103. Source: OSTI; NTIS; INIS; GPO Dep.

The Interstate Oil and Gas Compact Commission (IOGCC) has conducted a series of studies to evaluate the known, remaining oil resource in twenty-three (23) states. The primary objective of the IOGCC's effort is to examine the potential impact of an aggressive and focused program of research, development, and demonstration (RD&D) and technology transfer on future oil recovery in the United States. As part of a larger effort by the IOGCC, this report focuses on the potential economic, social, and political benefits of improved oil recovery to the nation as a whole. Individual reports for major oil producing states have been separately published. The individual state reports include California, Illinois, Kansas, Louisiana, New Mexico, Oklahoma, Texas, and Wyoming. The analysis presented in this report is based on the databases and models available in the Tertiary Oil Recovery Information System (TORIS). TORIS is a tested and verified system maintained and operated by the Department of Energy's Bartlesville Project Office. The TORTS system was used to evaluate over 2,300 major reservoirs in a consistent manner and on an individual basis, the results of which have been aggregated to arrive at the national total.

108 (DOE/BC/14431–1-Vol.3) **An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States.** Interstate Oil Compact Commission, Oklahoma City, OK (United States). Nov 1994. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89BC14431. Order Number DE95000107. Source: OSTI; NTIS; INIS; GPO Dep.

The Interstate Oil and Gas Compact Commission (IOGCC) has conducted a series of studies to evaluate the known, remaining oil resource in twenty-three (23) states. The primary objective of the IOGCC's effort is to examine the potential impact of an aggressive and focused program of research, development, and demonstration (RD&D) and technology transfer on future oil recovery in the United States. As part of a larger effort by the IOGCC, this report focuses on the potential economic benefits of improved oil recovery in the states of Louisiana and Texas. Individual reports for six other oil producing states and a national report have been separately published. The analysis presented in this report is based on the databases and models available in the Tertiary Oil Recovery Information System (TORIS).

109 (DOE/BC/14431–1-Vol.4) **An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States.** Interstate Oil Compact Commission, Oklahoma City, OK (United States). Nov 1994. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89BC14431. Order Number DE95000106. Source: OSTI; NTIS; INIS; GPO Dep.

The Interstate Oil and Gas Compact Commission (IOGCC) has conducted a series of studies to evaluate the known, remaining oil resource in twenty-three (23) states. The primary objective of the IOGCC's effort is to examine the potential impact of an aggressive and focused program of research, development, and demonstration (RD&D) and technology transfer on future oil recovery in the United States. As part of a larger effort by the IOGCC, this report focuses on the potential economic benefits of improved oil recovery in the states of New Mexico and Wyoming. Individual reports for six other oil producing states and a national report have been separately published by the IOGCC. The analysis presented in this report is based on the databases and models available in the Tertiary Oil Recovery Information System (TORIS). Overall, well abandonments and more stringent environmental regulations could limit economic access to New Mexico's known, remaining oil resource. The high risk of near-term abandonment and the significant benefits of future application of improved oil recovery technology, clearly point to a need for more aggressive transfer of currently available technologies to domestic oil producers. Development and application of advanced oil recovery technologies could have even greater benefits to the state and the nation. A collaborative, focused RD&D effort, integrating the resources and expertise of industry, state and local governments, and the Federal government, is clearly warranted. With effective RD&D and a program of aggressive technology transfer to widely disseminate its results, oil production could be maximized. The resulting increase in production rates, employment, operator profits, state and Federal tax revenues, and energy security will benefit both the states of New Mexico and Wyoming and the nation as a whole.

110 (DOE/BC/14431–1-Vol.5) **An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States.** Interstate Oil Compact Commission, Oklahoma City, OK (United States). Nov 1994. 270p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-89BC14431. Order Number DE95000105. Source: OSTI; NTIS; INIS; GPO Dep.

The Interstate Oil and Gas Compact Commission (IOGCC) has conducted a series of studies to evaluate the known, remaining oil resource in twenty-three (23) states. The primary objective of the IOGCC's effort is to examine the potential impact of an aggressive and focused program of research, development, and demonstration (RD&D) and technology transfer on future oil recovery in the United States. As part of a larger effort by the IOGCC, this report focuses on the potential economic benefits of improved oil recovery in the states of Kansas, Illinois and Oklahoma for five other oil producing states and a national report have been separately published by the IOGCC. The analysis presented in this report is based on the databases and models available in the Tertiary Oil Recovery Information System (TORIS). Overall, well abandonments and more stringent environmental regulations could limit economic access to Kansas' known, remaining oil resource. The high risk of near-term abandonment and the significant benefits of future application of improved oil recovery technology, clearly point to a need for more aggressive transfer of currently available technologies to domestic oil producers. Development and application of advanced oil recovery technologies could have even greater benefits to the state and the nation. A collaborative, focused RD&D effort, integrating the resources and expertise of industry, state and local governments, and the Federal government, is clearly warranted. With effective RD&D and a program of aggressive technology transfer to widely disseminate its results, oil production could be maximized. The resulting increase in production rates, employment, operator profits, state and Federal tax revenues, and energy security will benefit both the state of Kansas, Illinois and Oklahoma and the nation as a whole.

111 (DOE/BC/14831–11) **Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Quarterly status report (final), April 1, 1994–June 31, 1994.** Schenewerk, P.A. Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering. 30 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14831. Order Number DE95002772. Source: OSTI; NTIS; GPO Dep.

A report on the simulation work performed on Reservoir 3 of Field 2 (hereinafter referred to as the U-8 reservoir) was completed in the form of a Master's Thesis by Mr. George J. Koperna, Jr for the Department of Petroleum and Natural Gas Engineering, College of Mineral and Energy Resources, West Virginia University. Upon completing the history match of the reservoir and the running of several predictive runs, evidence indicates the following: layers "A" and "B" of the U-8 sand are in communication; the given reservoir relative permeability data was not appropriate for the U-8 sand reservoir and the relative permeabilities were modified to enable a history match to be obtained; the vertical permeability values were found to be within the accepted range for the Gulf of Mexico ($0.1Kx < Kz < 0.5Kx$, with $Kx = Ky$) at 0.4 Kx; based on industry's desired design (water injection of 5100 BBL/D), the best possible production scenario is in the northeastern portion of the reservoir; if the water injection rate is doubled 10,200 STB/D, the additional oil recovery may be increased by 33% (1,214 MSTB) in the vertical well scenario and by 37% (1,320 MSTB) in the horizontal well scenario; by converting the production wells to water injection wells

and drilling a horizontal production well in the north-central portion of the reservoir, the production obtained is approximately 90% of the production obtained from the northeastern portion of the reservoir at the same field injection rate. Predictive models for undeveloped oil and immiscible/miscible processes continued. The design of the miscible and updip displacement models as well as the design of the economic and timing models also continued. Data validation, map measurements, model development and supporting cost data collection continued. Critical Process Parameter Laboratory Experiments have been completed. Computer simulations of the experimental work has also been completed.

112 (DOE/BC/14856–T1) **A model technology transfer program for independent operators: Kansas Technology Transfer Model (KTTM).** Schoeling, L.G. Kansas Univ., Lawrence, KS (United States). Energy Research Center. Sep 1993. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92BC14856. Order Number DE95001703. Source: OSTI; NTIS; GPO Dep.

This report describes the development and testing of the Kansas Technology Transfer Model (KTTM) which is to be utilized as a regional model for the development of other technology transfer programs for independent operators throughout oil-producing regions in the US. It describes the linkage of the regional model with a proposed national technology transfer plan, an evaluation technique for improving and assessing the model, and the methodology which makes it adaptable on a regional basis. The report also describes management concepts helpful in managing a technology transfer program. The original Tertiary Oil Recovery Project (TORP) activities, upon which the KTTM is based, were developed and tested for Kansas and have proved to be effective in assisting independent operators in utilizing technology. Through joint activities of TORP and the Kansas Geological Survey (KGS), the KTTM was developed and documented for application in other oil-producing regions. During the course of developing this model, twelve documents describing the implementation of the KTTM were developed as deliverables to DOE. These include: (1) a problem identification (PI) manual describing the format and results of six PI workshops conducted in different areas of Kansas, (2) three technology workshop participant manuals on advanced waterflooding, reservoir description, and personal computer applications, (3) three technology workshop instructor manuals which provides instructor material for all three workshops, (4) three technologies were documented as demonstration projects which included reservoir management, permeability modification, and utilization of a liquid-level acoustic measuring device, (5) a bibliography of all literature utilized in the documents, and (6) a document which describes the KTTM.

113 (DOE/BC/14862–6) **Productivity and injectivity of horizontal wells: Annual report, March 10, 1993–March 9, 1994.** Fayers, F.J.; Aziz, K.; Hewett, T.A.; Arbabi, S. Stanford Univ., CA (United States). Dept. of Petroleum Engineering. Oct 1994. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93BC14862. Order Number DE95000102. Source: OSTI; NTIS; GPO Dep.

In this report, the investigators review a range of reservoir scenarios in which horizontal wells can be advantageous and discuss some of the modeling problems associated with calculating well connection factors, productivity indices, coning behavior and well two-phase pressure drops. We show illustrative coning calculations and the implications of the well model on distribution of post-breakthrough gas saturations. Such calculations then open up the possibility of determining optimal recompletion strategies and/or additional hydraulic fracturing.

114 (DOE/BC/14880–9) **Improved techniques for fluid diversion in oil recovery: Quarterly technical progress report, July 1, 1994–September 30, 1994.** Seright, R.S. New Mexico Inst. of Mining and Technology, Socorro, NM (United States). New Mexico Petroleum Recovery Research Center. 1 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92BC14880. Order Number DE95002760. Source: OSTI; NTIS; GPO Dep.

This three-year project has two general objectives. The first objective is to compare the effectiveness of gels in fluid diversion with those of other types of processes. Several different types of fluid-diversion processes will be compared, including those using gels, foams, emulsions, and particulates. The ultimate goals of these comparisons are to (1) establish which of these processes are most effective in a given application and (2) determine whether aspects of one process can be combined with those of other processes to improve, performance. Analyses will be performed to assess where the various diverting agents will be most effective (e.g., in fractured vs unfractured wells, deep vs near-wellbore applications, reservoirs with vs without crossflow, or injection wells vs production wells). Experiments will be performed to verify which materials are the most effective in entering and blocking high-permeability zones. Another objective of the project is to identify the mechanisms by which materials (particularly gels) selectively reduce permeability to water more than to oil. In addition to establishing why this occurs, our research will attempt to identify materials and conditions that maximize this phenomenon. (1) During unconfined gelant injection, a satisfactory placement for the gelant is far more likely to occur in a linear flow geometry than in an anisotropic radial flow geometry. (2) As we expected, the injectivity after gelation decreases as the value of residual resistance factor and the distance of gelant penetration increase. (3) For a given permeability ratio, the degree of gelant penetration, $(r_{\pi}-r_w)/(r_{px}-r_w)$, increases with increased resistance factor.

115 (DOE/BC/14899–17) **Modification of chemical and physical factors in steamflood to increase heavy oil recovery: Annual report, October 1, 1992–September 30, 1993.** Yortsos, Y.C. University of Southern California, Los Angeles, CA (United States). Oct 1994. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93BC14899. Order Number DE95000110. Source: OSTI; NTIS; GPO Dep.

Thermal methods, and particularly steam injection, are currently recognized as the most promising for the efficient recovery of heavy oil. Despite significant progress, however, important technical issues remain open. Specifically, still inadequate is our knowledge of the complex interaction between porous media and the various fluids of thermal recovery (steam, water, heavy oil, gases, and chemicals). While, the interplay of heat transfer and fluid flow with pore- and macro-scale heterogeneity is largely unexplored. Objectives of this work contract are to carry out new studies in the following areas: displacement and flow properties of fluids involving phase change in porous media; flow properties of mobility control fluids (such as foam); and the effect of reservoir heterogeneity on thermal recovery. Specific projects address the need to improve heavy oil recovery from typical reservoirs as well as less conventional fractured reservoirs producing from vertical or horizontal wells. In the area of vapor-liquid flow, we present the continuation of work on the pore network modeling of bubble growth in porous media driven by the application of a prescribed heat flux or superheat. The scaling of bubble growth in porous media is also discussed. In another study we study the problem of steam injection in fractured systems using visualization in micromodels. The interplay of drainage, imbibition and bubble growth problems is discussed.

116 (DOE/BC/14961–5) **Dynamic enhanced recovery techniques: Quarterly technical report, July 1994–September 1994.** Anderson, R.N. Columbia Univ., Palisades, NY (United States). Lamont-Doherty Earth Observatory. 15 Oct 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14961. Order Number DE95002612. Source: OSTI; NTIS; GPO Dep.

This quarterly progress report discusses database management, the field demonstration experiment, reservoir characterization, modeling, geochemistry and data integration technologies for the Department of Energy's Dynamic Enhanced Recovery Technologies program.

117 (DOE/BC/14963–5) **West Hackberry Tertiary Project annual technical progress report, September 3, 1993–September 2, 1994.** Gillham, T.H. Amoco Production Co., Houston, TX (United States). 27 Sep 1994. 291p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-93BC14963. Order Number DE95002766. Source: OSTI; NTIS; GPO Dep.

The West Hackberry Tertiary Project is a field test of the idea that air injection can be combined with the Double Displacement Process to produce a low cost tertiary recovery process which is economic at current oil prices. The Double Displacement Process is the gas displacement of a water invaded oil column for the purpose of recovering ternary oil by gravity drainage. The Double Displacement Process is based upon the concept that in fields such as West Hackberry waterdrive recoveries are typically 50%–60% of the original oil in place while gravity drainage recoveries average 80%–90% of the original oil in place. Therefore, by injecting a gas into a watered out reservoir, a gas cap will form and additional oil can be recovered due to gravity drainage. Although the Double Displacement Process has been shown to be successful in recovering tertiary oil in other fields, this project will be the first to utilize air injection in the Double Displacement Process. The use of air injection in this process combines the benefits of air's low cost and universal accessibility with the potential for accelerated oil recovery due to the combustion process. If successful, this project will demonstrate that the use of air injection in the Double Displacement Process will result in an economically viable tertiary process in reservoirs where tertiary oil recovery is presently uneconomical.

118 (DOE/BC/14989–1) **Application of integrated reservoir management and reservoir characterization to optimize infill drilling: Quarterly technical progress report, June 13, 1994–September 12, 1994.** Pande, P.K. Fina Oil and Chemical Co., Midland, TX (United States). Western Div. 12 Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC22-94BC14989. Order Number DE95002771. Source: OSTI; NTIS; GPO Dep.

This Quarterly Progress Report summarizes the technical progress of the project from June 13, 1994 to September 12, 1994. The core/log typing algorithm has been extended to all wells with modern log suites. This will allow for identification of pay and non-pay rock types over the entire Unit. Correlative stratiographic units have been identified and are being extended to all wells unitwide. Structural and isopach maps are being contructed to assist in the geostatistical reservoir description. Reservoir performance contour maps have been constructed and are being utilized in the day to day reservoir management of the Unit. In addition, injection rate and pressure data are being analyzed using the conventional Hall and Hearn methods.

119 (DOE/CE/15553–T6) **System to inject steam and produce oil from the same wellbore through downhole valve switching: Final report.** Southern California Research Corp., San Rafael, CA (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92CE15553. Order Number DE95001762. Source: OSTI; NTIS; GPO Dep.

Through direct contacts with many California Operators, the potential market for this technology and hardware was more closely defined. The largest market might be for re-entry into existing but shut-in wells, equipped with 7″OD cemented casings, for which a suitable configuration was designed. For field-testing any prototype Downhole equipment, however, Operators and Service Companies prefer to start with a new well, for better control of the well characteristics. In the relatively shallow reservoirs where Steam injection is currently used with success, the additional drilling cost, in soft formations, is sufficiently small that this became the main design case. Substantial savings were obtained by reducing the number of Downhole valves from two to one and by replacing the twin hydraulically-controlled ball or flapper-type valves with a single sliding sleeve valve, operated by wireline. Laboratory tests conducted at UC-Berkeley confirmed the satisfactory operation of this type of valve with wet steam over extended periods. Low reservoir pressures dictated the use of artificial lift methods, with rod pumps considered the most economical. The availability of live steam downhole at all times is, however, a major advantage which led to the selection of a combined method of artificial lift: (1) steam-lift of the produced fluids up to the kick-off point of the medium curvature drainholes, (2) dumping of the produced fluids into a vertical separator/sump below the kick-off points, (3) vertical rod pumping of the liquid phases from the downhole separator/sump to the surface through a dedicated production tubing.

120 (DOE/MT/92012–7) **Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas.** Eggington, W.J.; Stevens, P.M.; John, C.J.; Harder, B.J.; Lindstedt, D.M. Mission Research Corp., San Diego, CA (United States). Oct 1994. 252p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92MT92012. Order Number DE95000101. Source: OSTI; NTIS; GPO Dep.

The cyclocraft is a proven hybrid aircraft, capable of VTOL, lifting heavy and bulky loads, highly controllable, having high safety characteristics and low operating costs. Mission Research Corporation (MRC), under Department of Energy sponsorship, is evaluating the potential use of cyclocraft in the transport of drill rigs, mud, pipes and other materials and equipment, in a cost effective and environmentally safe manner, to support oil and gas drilling, production, and transportation operations in wetland areas. Based upon the results of an earlier parametric study, a cyclocraft design, having a payload capacity of 45 tons and designated H.1 Cyclocraft, was selected for further study, including the preparation of a preliminary design and a development plan, and the determination of operating costs. This report contains all of the results derived from the program to evaluate the use of cyclocraft in the support of oil and gas drilling and production operations in wetland areas.

121 (ETDE/DE-mf–95716307) **Removal of organic scales and processing of tertiary oil. Pt. 1: Removal of organic scales in watered-down wet oil probes.** Kleinitz, W. Deilmann Erdoel Erdgas GmbH, Hannover (Germany). Nov 1992. 299p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326540A. Order Number DE95716307. Source: OSTI; NTIS (US Sales Only).

In the course of a project of general years' duration, the physicochemical conditions causing scaling were investigated. Three techniques were compared with regard to their efficiency in scales removal, i.e. solvent stimulation, pressure dependent production, and shut-off of preferred water pathways, in selected wells. The efficiency was determined on the basis of changes in the colloid composition. (orig.)

122 (LA-UR–94-2871) **Subsurface fracture mapping using microearthquakes detected during primary oil production, Clinton County, Kentucky.** Rutledge, J.T. (Nambe Geophysical, Inc. (United States)); Phillips, W.S.; Roff, A.; Albright, J.N.; Hamilton-Smith, T.; Jones, S.K.; Kimmich, K.C. Los Alamos National Lab., NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (SPE–28384; CONF-940907–1: Annual technical conference and exhibition of the Society of Petroleum Engineers (SPE), New Orleans, LA (United States), 25-28 Sep 1994). Order Number DE94018299. Source: OSTI; NTIS; GPO Dep.

Downhole microseismic monitoring tests were conducted in Clinton County, Kentucky to determine if microearthquakes associated with primary production could be detected on a scale of interwell distances ($\geq$400 ft) and to determine if such microearthquakes could be used to map reservoir fractures. The oil reservoirs occur in shallow (750 to 2400 ft), low-porosity ($<$ 2%), carbonate rocks of Ordovician age. The reservoir system controlling the occurrence and flow of off and its relationship to the local and regional geology is poorly understood. Discrete reservoir microearthquakes were detected at an average rate of 11 events per week and at distances up to 4000 ft in an initial monitoring test using a single, triaxial downhole geophone receiver. In a second monitoring test 2 downhole, triaxial geophone tools were placed in a monitor well 800 ft from a new, high-volume oil well. Over a 6-month period of continuous monitoring 165 discrete, high-quality, microearthquake waveforms were recorded. Approximately 11,000 barrels of fluid were extracted in the monitor area during the 6-month period. Presently, it is unknown whether or not the microseismicity is induced by production. Hypocenters computed for 121 events delineate 4 extensive (up to 0.15 square-miles), low-angle, planar features striking approximately N65°E within the Ordovician reservoir depth interval. A composite fault-plane solution indicates a thrust focal mechanism. Such thrust structures are not observed in the surface-exposed Mississippian section, which lies above and is separated from the Ordovician section by a major unconformity of

Devonian age. General relationships between the fractures revealed by the microseismicity and oil occurrence have yet to be demonstrated in the study area. The observed microseismicity occurs away from production wells, and to date, no new wells have been drilled into the mapped fracture along which shear displacement was detected.

123 (SAND–94-1743) **Geomechanics of horizontally-drilled, stress-sensitive, naturally-fractured reservoirs.** Holcomb, D.J.; Brown, S.R.; Lorenz, J.C.; Olsson, W.A.; Teufel, L.W.; Warpinski, N.R. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001795. Source: OSTI; NTIS; GPO Dep.

Horizontal drilling is a viable approach for accessing hydrocarbons in many types of naturally-fractured reservoirs. Cost-effective improvements in the technology to drill, complete, and produce horizontal wells in difficult geologic environments require a better understanding of the mechanical and fluid-flow behavior of these reservoirs with changes ineffective stress during their development and production history. In particular, improved understanding is needed for predicting borehole stability and reservoir response during pore pressure drawdown. To address these problems, a cooperative project between Oryx Energy Company and Sandia National Laboratories was undertaken to study the effects of rock properties, in situ stress, and changes in effective stress on the deformation and permeability of stress sensitive, naturally-fractured reservoirs. A low value for the proelastic parameter was found, implying that the reservoir should have a low sensitivity to declining pore pressure. A surprisingly diverse suite of fractures was identified from core. From the coring-induced fractures, it was plausible to conclude that the maximum principal stress was in the horizontal plane. Measurements on permeability of naturally fractured rock in a newly-developed experimental arrangement showed that slip on fractures is much more effective inchangingpcrtncability than is normal stress. The intermediate principal stress was found to have a strong effect, on the strength and ductility of the chalk, implying the need for a more sophisticated calculation of borehole stability.

0204 Processing

Refer also to citation(s) 121, 1117, 1340, 1364

124 (ETDE/DE-mf–95716306) **Removal of organic scales and processing of tertiary oil. Pt. 2: Effects of wet oil produced by enhanced recovery techniques on the production and processing systems.** Kleinitz, W. Deilmann Erdoel Erdgas GmbH, Hannover (Germany). Nov 1992. 126p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326540A. Order Number DE95716306. Source: OSTI; NTIS (US Sales Only).

Injection of EOR chemicals, e.g. tensides and/or polymers, for enhanced recovery may, in the long run, raise problems on the production side such as bacterial activity and H_2S formation, emulsion stabilisation in the processing system, corrosion in the pumping systems, problems in crude oil processing, and determination of the injection water quality. These effects are important, owing to the fact that tertiary projects utilize the technical facilities of the secondary production processes of other field sectors. Also, the tertiary deposit water is often recycled for mixing the EOR chemicals or for maintaining the deposit pressure of the field. (orig.)

0207 Economic, Industrial, and Business Aspects

Refer also to citation(s) 107, 108, 109, 110

125 (DOE/EIA–0109(94/10)) **Petroleum supply monthly, October 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 27 Oct 1994. 197p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002205. Source: OSTI; NTIS; GPO Dep.

The Petroleum Supply Monthly (PSM) is one of a family of four publications produced by the Petroleum Supply Division within the Energy Information Administration (EIA) reflecting different levels of data timeliness and completeness. The other publications are the Weekly Petroleum Status Report (WPSR), the Winter Fuels Report, and the Petroleum Supply Annual (PSA). Data presented in the PSM describe the supply and disposition of petroleum products in the United States and major US geographic regions. The data series describe production, imports and exports, inter-Petroleum Administration for Defense (PAD) District movements, and inventories by the primary suppliers of petroleum products in the United States (50 States and the District of Columbia). The reporting universe includes those petroleum sectors in primary supply. Included are: Petroleum refiners, motor gasoline blenders, operators of natural gas processing plants and fractionators, inter-PAD transporters, importers, and major inventory holders of petroleum products and crude oil. When aggregated, the data reported by these sectors approximately represent the consumption of petroleum products in the United States. Data presented in the PSM are divided into two sections: Summary Statistics and Detailed Statistics.

126 (DOE/EIA–0538(94/95-4)) **Winter fuels report, week ending October 28, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 3 Nov 1994. 78p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002439. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD'S; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

127 (DOE/EIA–0538(94/95-5)) **Winter fuels report.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. [1994]. 77p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002679. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policymakers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports, and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's I, II, and III; natural gas supply and disposition and underground storage for the US and consumption for all PADD's; as well as selected National average prices; residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the US and selected cities; and a 6-10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city. This report will be published weekly by the EIA starting the second week in October 1994 and will continue until the second week in April 1995.

0208 Waste Management

128 (DOE/MT/92008–8) **Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994.** Adewumi, M.A.; Watson, R.W.; Tian, S.; Heckman, S.; Safargar, S.; Drielinger, I. Pennsylvania State Univ., University Park, PA (United States). Mineral Engineering, Petroleum and Natural Gas Engineering Section. 1 Jul 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92MT92008. Order Number DE95002763. Source: OSTI; NTIS; GPO Dep.

The specific objective of the research is to demonstrate that the characteristics of wastewater from stripper oil wells and marginal

gas wells are sufficiently similar to be treated under a standardized treatment methodology, that the environmental impact of the discharge of treated brines from both stripper oil and gas wells can be adequately regulated, and that the inclusion of marginal gas wells in the same category as stripper wells is appropriate, especially for wells operating in the Appalachian Basin. Binary and multi-element studies were continued in order to determine the catalytic and inhibiting effects of copper, zinc, aluminum and lead. The parameters and operating conditions were varied to investigate the effectiveness of the laboratory-scale treatment on the removal of iron in coexistence of other metals. The construction of mobile brine treatment unit was completed and tested for its constructional integrity and any possible leakage. The response and feed-back from the operators who had a chance to test the designed software package was taken into the consideration to improve the developed software package. The kinetics coefficients (k and alpha) needed for the model development were determined from the kinetics data.

129 (ETDE/DE-mf–95716315) **Design, construction and testing of a rotary kiln for the thermal treatment of contaminated soils: Final report.** Lehmann, G. Ruhrkohle AG, Herne (Germany). Mar 1993. 223p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 1450410I. (RAG–07760000). Order Number DE95716315. Source: OSTI; NTIS (US Sales Only).

The R and D project aimed at constructing and operating an indirectly heated rotary kiln (low-temperature carbonizer) with waste gas scrubbing unit for the treatment of contaminated soil, e.g. from old cokery sites. The treated soil should be reusable, the plant's emission values should remain below the limits specified in the "TA Luft 86" instruction. Initial tests run from May 1988 onwards were followed by the final commissioning in February 1989. Both lowly and highly contaminated soils were treated. Until December 31, 1991, some 80,000 tonnes of mainly PAH contaminated soils from the former Koenigsborn 3/4 mine and cokery site of Ruhrkohle AG as well as 7,000 tonnes of soils from other mine and cokery sites with different contaminations (mineral oils, phenoles, cyanides and others) were treated with good decontamination results. Subsequent reclamation tests on the treated soils were successful. The measuring values for substances hazardous for health in the waste gas of the combustion unit ranged below the limits of the "TAL 86" instruction. (orig.)

0209 Environmental Aspects

Refer also to citation(s) 478, 501

0250 Combustion

130 (DOE/AL/43771–T4) **Fundamental studies of fuel chemistry as related to internal combustion engine phenomena: Technical progress report, July 1, 1988–June 30, 1989.** Dryer, F.L.; Brezinsky, K. Princeton Univ., NJ (United States). Dept. of Mechanical and Aerospace Engineering. Jul 1989. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-87AL43771. Order Number DE95001553. Source: OSTI; NTIS; GPO Dep.

The present research effort was initiated with the intent of providing substantially improved insights (through homogeneous gas phase kinetic studies at different constant pressures) to the fuel chemistry issues important to autoignition in engines. The conditions of the proposed experiments were chosen to represent those similar to the engine parameters under knocking conditions: temperatures in the range of 700–1,100K, pressures from one to approximately 20 atmospheres and stoichiometries around one. A major part of the proposed research has been to design and construct a variable pressure flow reactor facility in which a range of reaction pressures, and in fact, lower reaction temperatures could be accessed. The reactor facility design and construction are nearly complete, and initial testing has begun to compare the overall experimental operating characteristics of the reactor with the design parameters. Experiments on Isobutene/oxygen mixtures have also been conducted in the existing atmospheric pressure flow reactor at about 1,150 K and in an equivalence ratio range of pyrolysis with about 100 ppm oxygen background to 0.42. A detailed kinetic model has been developed to interpret the pyrolysis and oxidation characteristics. 89 refs.

03 NATURAL GAS

Refer also to citation(s) 927

0302 Reserves, Geology, and Exploration

Refer also to citation(s) 97, 98, 100, 101, 102, 103, 135, 136

131 (DOE/MC/26026–3902) **A novel geotechnical/geostatistical approach for exploration and production of natural gas from multiple geologic strata: Technical progress report, April–June, 1994.** Brunk, R.G. West Virginia Coll., Beckley, WV (United States). Jul 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26026. Order Number DE95001432. Source: OSTI; NTIS; GPO Dep.

This report summarizes activities for Task 12, Dewatering/Production Extension Test Period. The Project wells continued to be shut in as research continued into possible production scenarios. The most attractive option seemed to be the opportunity to tie into a local well systems operated by Belden and Blake (formerly Peake). Initial costing/bidding activities were conducted for summer's compression, tie-in, and workover tasks. Work continued in an effort to finalize plans for compressor installation and tie-in to Peake system.

132 (DOE/MC/30086–3888) **Naturally fractured tight gas reservoir detection optimization: Quarterly status report, October 1, 1993–January 30, 1994.** Advanced Resources International, Inc., Arlington, VA (United States). 1 Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30086. Order Number DE95000012. Source: OSTI; NTIS; GPO Dep.

The geologic assessment of the Piceance Basin is progressing as originally planned. Considerable effort has been expended initially to organize logistics associated with the various subcontractors to insure timely completion of tasks. Delays in subcontract approval for the RTM model with Indiana University has caused a short delay in initiation of work on the modeling effort. That work delay is reflected in underspending for the month of December as reported in the cost management report for that month: Completion of a suitable well log database for the subarea surrounding the Multiwell Experimental Site (MWX), site and throughout the Piceance Basin is nearing completion. Once final error checking is complete, this database will allow us to rapidly create maps of appropriate geologic intervals to study the regional structural geology and provide a window into the kinematics of fracturing in the Piceance Basin. Understanding of the detailed structural and stratigraphic framework is key to our understanding of fracture genesis in the basin and our ability to predict orientation and density of natural fractures in the subsurface.

133 (DOE/MC/30086–3889) **Naturally fractured tight gas reservoir detection optimization: Quarterly status report, January 1, 1994–March 31, 1994.** Advanced Resources International, Inc., Arlington, VA (United States). 15 Apr 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30086. Order Number DE95000013. Source: OSTI; NTIS; GPO Dep.

The objective of the study will be to demonstrate the geological and geophysical technology needed to detect and analyze, economically, naturally fractured tight gas reservoirs. Delays in subcontract approval for the RTM model with Indiana University had caused additional delays in commencement of the modeling effort. Now that the subcontract is signed, modeling work has commenced. Subcontract preparation and negotiations for the aeromagnetic fly-over by World Geoscience are also proceeding as planned. Because we have clearly documented production trends in the Parachute and Rulison fields, future effort will be directed toward geologic explanations of these production trends. Several

regional cross-sections through these fields will be used to illustrate geologic differences and similarities between the two fields. This information will be critical to calibration of the RTM model and development of the optimal locations for infill drilling and recompletion strategies. Upon completion of the field studies, focus will be redirected toward development of a regional tectonic synthesis from Precambrian through today for the Piceance Basin and the uplifts surrounding this region. This effort will integrate published studies, seismic, wellbore, gravity and remote sensing data to delineate regions in the basin where additional field work is necessary to fully determine the geologic evolution of the basin.

0303 Drilling, Production, and Processing

Refer also to citation(s) 120, 123, 131, 133, 1344

134 (ANL/ET/CP–83730) **Ceramic membranes for methane conversion.** Balachandran, U. (Argonne National Lab., IL (United States). Energy Technology Div.); Dusek, J.T.; Mieville, R.L.; Maiya, P.S.; Kleefisch, M.S.; Pei, S.; Kobylinski, T.P.; Udovich, C.A. Argonne National Lab., IL (United States). Energy Technology Div. Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409168–8: Coal liquefaction and gas conversion contractors' review conference, Pittsburgh, PA (United States), 7-8 Sep 1994). Order Number DE95002908. Source: OSTI; NTIS; GPO Dep.

In conventional conversion of methane to syngas, a significant cost of the partial oxidation process is that of the oxygen plant. In this report, the authors offer a technology that is based on dense ceramic membranes and that uses air as the oxidant for methane-conversion reactions, thus eliminating the need for the oxygen plant. Certain ceramic materials exhibit both electronic and ionic conductivities (of particular interest is oxygen-ion conductivity). These materials transport not only oxygen ions (functioning as selective oxygen separators) but also electrons back from the reactor side to the oxygen/reduction interface. No external electrodes are required and if the driving potential of transport is sufficient, the partial-oxidation reactions should be spontaneous. Such a system will operate without an externally applied potential. Oxygen is transported across the ceramic material in the form of oxygen anions, not oxygen molecules. Long tubes of Sr-Fe-Co-O (SFC) membrane were fabricated by plastic extrusion, and thermal stability of the tubes was studied as a function of oxygen partial pressure and high-temperature XRD. Mechanical properties were measured and found to be acceptable for a reactor material. Fracture of certain SFC tubes was the consequence of an oxygen gradient that introduced a volumetric lattice difference between the inner and outer walls. However, tubes made with a particular stoichiometry (SFC-2) provided methane conversion efficiencies of >99% in a reactor and some of these tubes have operated for up to ≈1,000 h.

135 (DOE/MC/28139–3878) **[Development of a gas information system (GASIS)]: Quarterly technical progress report, March 1994–May 1994.** Energy and Environmental Analysis, Inc., Arlington, VA (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC28139. Order Number DE95001322. Source: OSTI; NTIS; GPO Dep.

The project objective is to develop (1) a computerized natural gas recovery energy-related technology database, which will be primarily assembled from the basin atlas series–data sets, consisting of geology, production history, and reservoir engineering parameters of major gas reservoirs and (2) a directory to the various natural gas databases or information centers that are available. During this reporting period, work was performed on Task 1, Obtain User Input. Task 2, Develop Source Directory, and Task 3, Develop Natural Gas Data System. No work was done on Task 4, Technology Transfer, or Task 5, Storage Media. Accomplishments for this period are described briefly.

0306 Economic, Industrial, and Business Aspects

Refer also to citation(s) 126, 127

136 (DOE/EIA–0130(94/10)) **Natural gas monthly, October 1994.** USDOE Energy Information Administration, Washington, DC (United States). Oct 1994. 108p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002163. Source: OSTI; NTIS; GPO; GPO Dep.

The Federal Energy Regulatory Commission (FERC) Order 636 prompted an increase of natural gas market centers (trading hubs) across the United States and Canada. These regulations allow customers (end users) to select services directly from producers and marketers. Pipeline companies must provide transportation unbundled from sales services, provide open access to transportation, and provide open access to storage. FERC Order 636-B also requires market centers to be fairly small, i.e., a 30-mile radius around a central point. Some market centers are designed to offer a variety of physical services, including storage, parking, wheeling, pooling, balancing, and peaking. Financial or transactional services, such as title transfers, capacity release, nomination, electronic trading, risk management, and credit are also being offered. The Electronic Bulletin Board (EBB) services through these centers will provide a variety of information on pricing; weather; cash trading to match bids; physical gas offers; as well as financial, regulatory, and industry news.

137 (DOE/EIA–0131(93)) **Natural gas annual 1993.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. 21 Oct 1994. 255p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002470. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

The Natural Gas Annual provides information on the supply and disposition of natural gas to a wide audience including industry, consumers, Federal and State agencies, and educational institutions. The 1993 data are presented in a sequence that follows natural gas (including supplemental supplies) from its production to its end use. Tables summarizing natural gas supply and disposition from 1989 to 1993 are given for each Census Division and each State. Annual historical data are shown at the national level.

138 (NRRI–94-13) **Restructuring local distribution services: Possibilities and limitations.** Duann, D.J. National Regulatory Research Inst., Columbus, OH (United States). Aug 1994. 74p. Sponsored by National Association of Regulatory Utility Commissioners, Washington, DC (United States). Source: OSTI; The National Regulatory Research Institute, The Ohio State University, 1080 Carmack Road, Columbus, OH 43210.

The restructuring of local distribution services is now the focus of the natural gas industry. It is the last major step in the "reconstitution" of the natural gas industry and a critical element in realizing the full benefits of regulatory and market reforms that already have taken place in the wellhead and interstate markets. It could also be the most important regulatory initiative for most end-use customers because they are affected directly by the costs and reliability of distribution services. Several factors contribute to the current emphasis on distribution service restructuring. They include the unbundling and restructuring of upstream markets, a realization of the limitations of supply-side options (such as gas procurement oversight), and the increased diversity and volatility of gas demand facing local distribution companies. Local distribution service is not one but a series of activities that start with commodity gas procurement and extend to transportation, load balancing, storage, and metering and billing of services provided. There are also considerable differences in the economies of scale and scope associated with these various activities. Thus, a mixture of supply arrangements (such as a competitive market or a monopoly) is required for the most efficient delivery of local distribution services. A distinction must be made between the supply of commodity gas and the provision of a bundled distribution service. This distinction and identification of the best supply arrangements for various distribution service components are the most critical factors in developing appropriate restructuring policies. For most state public utility commissions the criteria for service restructuring should include pursuing the economies of scale and scope in gas distribution, differentiating and matching gas service reliability and quality with customer requirements, and controlling costs associated with the search, negotiation, and contracting of gas services.

0307 Waste Management

Refer also to citation(s) 128

0308 Environmental Aspects

139 (DOE/MC/30098–3915) **Sour gas plant subsurface remediation technology research and demonstration project: Quarterly technical progress report, January 1, 1994–March 31, 1994.** Stepan, D.J.; Kuehnel, V. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Apr 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30098. Order Number DE95001478. Source: OSTI; NTIS; GPO Dep.

Recognizing the potential impacts of sour gas plant operations on the subsurface environment, the Canadian Association of Petroleum Producers (CAPP), formerly the Canadian Petroleum Association (CPA), and Environment Canada initiated a multiphase study focusing on research related to the development and demonstration of remedial technologies for soil and groundwater contamination at these facilities. The first phase of the project was completed in 1990, and consisted of a comprehensive review of all soil and groundwater monitoring data submitted to Alberta Environment by sour gas plants in accordance with the Clean Water Act (1980). That review indicated that all but one of the 45 sour gas plants for which data were available exhibited some form of impact on soil and groundwater quality. The study identified the most frequently occurring contamination situations at the sites and classified them by source, type of contaminant, and the hydrogeological characteristics of the contaminated setting. The project steering committee subsequently selected the Strachan Gas Plant, located near Rocky Mountain House, Alberta, Canada, as a field research and remediation technology demonstration site. Research to be performed under this agreement is for activities in the areas of soil vapor extraction (SVE), bioventing, and bioremediation, all focusing on residual contamination in the unsaturated, or vadose, zone at the site, as well as evaluations of biological treatment of groundwater and ex situ soil remediation using solvent extraction in conjunction with photooxidation, solvent extraction in conjunction with microwave irradiation, and low-temperature thermal desorption.

0310 Legislation and Regulations

Refer also to citation(s) 138

0330 Properties and Composition

Refer also to citation(s) 631, 632

0340 Combustion

Refer also to citation(s) 1426

04 OIL SHALES AND TAR SANDS

Refer also to citation(s) 927

0404 Oil Production, Recovery, and Refining

Refer also to citation(s) 50

140 (DOE/MC/27286–3891) **The development of an integrated multistage fluid-bed retorting process: Quarterly report, April–June, 1994.** Carter, S.; Taulbee, D.; Stehn, J.; Vego, A.; Morgan, N. Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research. Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-90MC27286. Order Number DE95000015. Source: OSTI; NTIS; GPO Dep.

This report summarizes the progress made on the development of an integrated multistage fluidized bed retorting process (KENTORT II) during the period of April 1, 1994 through June 30, 1994. The KENTORT II process includes integral fluidized bed zones for pyrolysis, gasification, and combustion of the oil shale. The purpose of this program is to design and test the KENTORT II process at the 50-lb/hr scale. A series of seven mass- and carbon-balanced runs was completed in the 50-lb/hr KENTORT II Process Development Unit (PDU) during this period. Complete operability of the system was demonstrated and design conditions in terms of temperature, run length, and shale feedrate were all achieved. Runs of approximately 10 hours duration generated oil yields that were nearly equivalent to the average oil yield produced in the 5-lb/hr bench-scale unit. The preliminary analysis of the data indicates that the effects of scale up are relatively insignificant. Any reduction in oil yield may be attributed to the increased rate of solid recycle to the pyrolysis zone. The PDU operated autothermally, and 93% carbon utilization was achieved, on average. The balance of the project will involve characterization of the oils and writing the final report.

141 (UCRL-JC–115758) **Nitrogen and carbon oxides chemistry in the HRS retorting process.** Reynolds, J.G. Lawrence Livermore National Lab., CA (United States). 12 Nov 1993. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-931181–2: Eastern oil shale symposium, Lexington, KY (United States), 17-19 Nov 1993). Order Number DE95001505. Source: OSTI; NTIS; GPO Dep.

The HRS Oil Shale Retort process consists of a pyrolysis section which converts kerogen of the shale to liquid and gaseous products, and a combustion section which burns residual carbon on the shale to heat the process. Average gas concentrations of selected gas phase species were determined from data measured at several placed on the combustion system of the Lawrence Livermore National Laboratory Hot-Recycled-Solids Retort Pilot Plant for representative rich and lean shale runs. The data was measured on-line and in real time by on-line meters (CO_2, CO, O_2), mass spectrometry (CO_2, O_2, H_2O, NO, CH_4, SO_2, N_2 and Ar), and Fourier transform infrared spectroscopy (CO_2, CO, H_2O, NO, N_2O, NO_2, CH_4, SO_2, NH_3, and HCN). For both the rich and leans shale runs, the Lift-Pipe Combustor (LFT) exhibited gas concentrations (sampled at the exit of the LFT) indicative of incomplete combustion and oxidation; the Delayed-Fall Combustor (DFC) exhibited gas concentrations (sampled at the annulus and the exit of the DFC) indicative of much more complete combustion and oxidation. The Fluidized-Bed Combustor exhibited gas concentrations which were controlled to a large extent by the injection atmosphere of the FBC. High levels of nitrogen oxides and low levels of CO were detected when full air injection was used, while high levels of CO and low levels of nitrogen-oxides were detected with partial N_2 injection. Sequential sampling limitations and nitrogen balances are also discussed.

0409 Waste Management

Refer also to citation(s) 141

0440 Combustion

Refer also to citation(s) 140, 141

05 NUCLEAR FUELS

Refer also to citation(s) 924

0501 Reserves, Exploration, and Mining

Refer also to citation(s) 940, 1803, 1804, 1805, 1806

142 (CONF-9308217–, pp. 35, Paper 5) **Uranium deposits and production in Eastern Europe and the former Soviet Union.** Gatzweiler, R. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental*

Restoration: An exchange between the United States and Germany. 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

More than half of the total 1946 to 1992 uranium production of the former Eastern Block (appr. 610.000 t U) is geologically related to the Bohemian Massif, a proterozoic block intensively reactivated during the Variszan Orogeny. Vein-type deposits within the basement and sandstone-type deposits in Permian and particularly Cretaceous platform sediments predominate. A substantial uranium production (approx. 86.000 t U) originated from several small vein- and sandstone-type deposits within alpine regions and forelands in Bulgaria, Hungary and Romania. The main production centres of the former Soviet Union (historic production approx. 220.000 t U i.e. equal to the historic production of East Germany) are related to the basement of the Eastern European craton (Ukraine) where sodium metasomatic-type deposits occur (largely exhausted) young cover complexes of the craton (east side of Caspian Sea), the Uralo-Mongolian Belt of Caledonian to Hercynian age and their young platform covers (mainly in Uzbekistan and Kazachstan and the Krasnokamensk Region in the Far East) and the alpine Caucasus region (Lermontov, exploited). Vein- and sandstone-type deposits predominate. In more recent years an increase of production from ISL-mining is noticed. Kasachstan and Uzbekistan hold the majority of these "low cost reserves."

143 (INIS-BR–3444) **Uranium in the southern Sao Francisco Craton and marginal belts.** Barreto, P.M.C. (Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil)); Tassinari, C.C.G.; Costa, C.C.; Cordani, L.K. Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil). 1988. 1p. (CONF-880010–: International conference on geochemical evolution of the continental crust, Poco de Caldas (Brazil), 1988). Order Number DE95603505. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. URANIUM CONCENTRATES/granites; URANIUM CONCENTRATES/isotope ratio; BRAZIL; GEOCHEMISTRY; ISOTOPE DATING; PETROLOGY; RUBIDIUM; STRONTIUM; TECTONICS; URANIUM; GRANITES

144 (INIS-mf–14377) **Alligator Rivers Analogue project - Geologic Setting: Final Report - Volume 2.** Snelling, A.A. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 118p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95606001. Source: OSTI; NTIS (US Sales Only); INIS.

In this volume the author synthesizes the results of the investigations carried over more than 20 years in the Koongarra area. It describes its regional geologic setting, geological evolution and the exploration activities carried out to date. The secondary ore of the Koongarra No. 1 uranium orebody provides a natural analogue suitable for validation of models for radionuclide transport. Although the primary uranium mineralisation occurs as uraninite veins and veinlets in fractures and brecciated zones that cross cut the steeply dipping (55 deg.C) host schists, weathering and dispersion of uranium within the zone of weathered schists has formed this secondary ore. The interaction of the weathering processes with the mineralogy and geochemistry of the unweathered host schists, and the primary hydrothermal alteration halo with and around the primary uranium mineralisation, has also been critical in the development of the secondary ore. This secondary ore natural analogue being at a shallow depth, plus the availability of open boreholes and drill core/borehole samples, has facilitated groundwater and rock investigations. 49 refs., 4 tabs., 42 figs.

145 (INIS-mf–14379) **Alligator Rivers Analogue project. Geophysics, petrophysics and structure: Final Report - Volume 4.** Emerson, D.W. (Sydney Univ., NSW (Australia). Dept. of Geology and Geophysics); Mills, K.J.; Hallett, M.S.; Cao, L.Q.; Miyakawa, K. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 125p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95606010. Source: OSTI; NTIS (US Sales Only); INIS.

The geophysical and geological field work at Koongarra (including borehole core logging) showed that the site itself is a folded, faulted, variably fractured Precambrian psammitic and pelitic schist sequence with a quasi-horizontal weathered zone superimposed on the steeply dipping rock fabric. The site is flanked by a high resistivity younger sandstone unit to the northwest and by a magnetic amphibolite/ferricrete sequence to the far southeast. The data interpretations elicited the essential structural and broad lithological elements. Gravity, magnetic and electrical laboratory and field studies confirmed a broad folded fractured sequence of dipping layered host rocks weathered in their upper parts and trending in a southwest-northeast direction. Qualitatively interpreted anomalies indicated the trend of the main groundwater movement to the south where dolomites are thought to act as a sink. These drainage features have SP, resistivity and radiometric expression. The roles of the Kombolgie Sandstone as a source of water and the Koongarra Fault as a barrier or otherwise were not established owing to the lack of sufficient samples for testing and also on account of the difficulty of geophysical access over the site's rugged escarpment. 40 refs., 13 tabs., 69 figs.

0504 Feed Processing

Refer also to citation(s) 940

146 (AREAEE–304) **Quality control in nuclear fuel fabrication.** Abdelhalim, A.S.; Elsayed, A.A.; Shaaban, H.I. Nuclear Research Centre, Inshas (Egypt). 1988. 27p. Order Number DE95605746. Source: OSTI; NTIS (US Sales Only); INIS.

The department of metallurgy, NRC Inchass is embarking on a programme of on a laboratory scale, fuel pins containing uranium dioxide pellets are going to be produced. The department is making use of the expertise and equipment at present available and is going to utilize the new fuel pin fabrication unit which would be shortly in operation. The fabrication and testing of uranium dioxide pellets then gradually adapt them and develop, a national know how in this field. This would also involve building up of indigenous experience through proper training of qualified personnel. That are applied to ensure quality of U o_2 pellets, the techniques implemented, the equipment used and the specifications of the equipment presently available. The following parameters are subject to quality control tests: density. O/U ration, hydrogen content, microstructure, each property will be discussed, measurements related to U o_2 powders, including flow ability, bulk density, O/U ratio, bet surface area and water content will be critically discussed. Relevant tests to ensure Q C of pellets are reviewed. These include surface integrity, density, dimensions, microstructure.4 fig., 1 tab.

0505 Uranium Enrichment

147 (CEA-CONF–11790) **Uranium Enrichment, an overview.** Coates, J.H. CEA Centre d'Etudes Nucleaires de Saclay, 91 - Gif-sur-Yvette (France). Direction du Cycle du Combustible. 1994. 21p. (CONF-9402113–: International Nuclear Fuel Seminar, Saclay (France), 7-18 Feb 1994). Order Number DE95606366. Source: OSTI; NTIS (US Sales Only); INIS.

This general presentation on uranium enrichment will be followed by lectures on more specific topics including descriptions of enrichment processes and assessments of the prevailing commercial and industrial situations. I shall therefore avoid as much as possible duplications with these other lectures, and rather dwell on: some theoretical aspects of enrichment in general, underlying the differences between statistical and selective processes, a review and comparison between enrichment processes, remarks of general order regarding applications, the proliferation potential of enrichment. It is noteworthy that enrichment: may occur twice in the LWR fuel cycle: first by enriching natural uranium, second by reenriching uranium recovered from reprocessing, must meet LWR requirements, and in particular higher assays required by high burn up fuel elements, bears on the structure of the entire front part of the fuel cycle, namely in the conversion/reconversion steps only involving UF_6 for the moment. (author). tabs., figs., 4 refs.

148 (CEA-CONF–11806) **Model of electronic energy relaxation in the test-particle Monte Carlo method.** Roblin, P. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement); Rosengard, A.; Nguyen, T.T. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Procedes d'Enrichissement. 1994. 2p. (CONF-9407148–:

19. International Symposium on Rarefied Gas Dynamics, Oxford (United Kingdom), 25-29 Jul 1994). Order Number DE95606367. Source: OSTI; NTIS (US Sales Only); INIS.

We previously presented a new test-particle Monte Carlo method (which we call PTMC), an iterative method to solve Boltzmann equation, first described by Haviland and Kogan and is now improved and very well-suited to the collisional steady gas flows. In this paper, we introduce a statistical method, published by Anderson to treat electronic-translational energy transfer by a collisional process and we apply it to atomic uranium vapor, which has multiple electronic energy states. (authors). 4 figs., 5 refs.

149 (NUREG–1484-Vol.1) **Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3070).** Zeitoun, A. (Science Applications International Corp., Germantown, MD (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Fuel Cycle Safety and Safeguards; Science Applications International Corp., Germantown, MD (United States). Aug 1994. 366p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This two-volume Final Environmental Impact Statement (FEIS) was prepared by the Nuclear Regulatory Commission (NRC) in accordance with regulation 10 CFR Part 51, which implements the National Environmental Policy Act (NEPA). Volume 1 contains the assessment of the potential environmental impacts for licensing the construction and operation of a proposed gaseous centrifuge enrichment facility to be built in Claiborne Parish, Louisiana, by Louisiana Energy Services, LP. (LES). The proposed facility would have a production capacity of about 866 metric tons annually of up to 5 weight percent enriched UF_6, using a proven centrifuge technology. Included in the assessment are construction, both normal operations and potential accidents (internal and external events), and the eventual decontamination and decommissioning (D&D)- of the site. Issues addressed include the purpose and need for the facility, the alternatives to the proposed action, potential disposition of the tails, the site selection process, and environmental justice. The NRC staff concludes that the facility can be constructed and operated with small and acceptable impacts on the public and the environment. The FEIS supports issuance of a license to the applicant, Louisiana Energy Services, to authorize construction and operation of the proposed facility.

150 (NUREG–1484-Vol.2) **Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3-70): Volume 2, Public comments and NRC response.** Zeitoun, A. (Science Applications International Corp., Germantown, MD (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Fuel Cycle Safety and Safeguards; Science Applications International Corp., Germantown, MD (United States). Aug 1994. 524p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

The Final Environmental Impact Statement (FEIS) (Volume 1), was prepared by the Nuclear Regulatory Commission (NRC) in accordance with regulation 10 CFR Part 51, which implements the National Environmental Policy Act (NEPA), to assess the potential environmental impacts for licensing the construction and operation of a proposed gaseous centrifuge enrichment facility to be built in Claiborne Parish, Louisiana by Louisiana Energy Services, L.P. (LES). The proposed facility would have a production capacity of about 866 metric tons annually of up to 5 weight percent enriched UF_6, using a proven centrifuge technology. Included in the assessment are co on, both normal operations and potential accidents (internal and external events), and the eventual decontamination and decommissioning of the site. In order to help assure that releases from the operation of the facility and potential impacts on the public are as low as reasonably achievable, an environmental monitoring program was developed by LES to detect significant changes in the background levels of uranium around the site. Other issues addressed include the purpose and need for the facility, the alternatives to the proposed action, potential disposition of the tails, the site selection process, and environmental justice. The NRC staff concludes that the facility can be constructed and operated with small and acceptable impacts on the public and the environment, and proposes to issue a license to the applicant, Louisiana Energy Services, to authorize construction and operation of the proposed facility. The letters in this Appendix have been divided into three sections. Section One contains letters to which the NRC responded by addressing specific comments. Section Two contains the letters that concerned the communities of Forest Grove and Center Springs. Section Three is composed of letters that required no response. These letters were generally in support of the facility.

151 (POEF-SH–19) **Analysis of criticality alarm system response to an accidental criticality outside the cascade process buildings at the Portsmouth Gaseous Diffusion Plant.** Negron, S.B. (Battelle, Columbus, OH (United States)); Tayloe, R.W. Jr.; Dobelbower, M.C. Oak Ridge National Lab., TN (United States). Jul 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00001. Order Number DE95001510. Source: OSTI; NTIS; INIS; GPO Dep.

Neutron dose rates at detector positions within the X-326, X-330, and X-333 buildings were evaluated for an accidental criticality outside of each building. As fissile material bearing equipment and containers are moved to and from each building, the possibility exists for a criticality accident to occur. This analysis demonstrates that a criticality accident which occurs at any position on the access roads alongside a process building can be detected. The detectable area includes all points within the access road boundary along each face of each building. This analysis also demonstrates that the criticality alarm systems of the process buildings will respond to criticality events occurring within the tie lines connecting the process buildings. This analysis was performed using the MCNP Monte Carlo neutron-proton transport code. The radiation source is the neutron leakage spectrum of a critical solution of 4.95 percent enriched UO_2F_2-H_2O at a power level corresponding to the ANSI ANS 8.3. Standard minimum accident of concern. The evaluated neutron fluxes were converted to neutron dose rates by use of the Henderson free-in-air response functions. Critical source positions correspond to the farthest source to detector distances on the access roads along each face of the three buildings, and the centerpoint of the building tie lines. This report contains the methodology used for this study, a background on the data used, and a section about the assumptions and limits to all conclusions.

0507 Fuels Production and Properties

Refer also to citation(s) 839, 841, 886, 1169

152 (DPW–53-1307-Del.Ver.) **Travel to Battelle Memorial Institute: Trip report, September 17, 24, and October 8, 1953.** Beckman, G.W. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 15 Oct 1953. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–827). Order Number DE95001996. Source: OSTI; NTIS; GPO Dep.

This report gives a brief summary of work at Battelle in support of Savannah River reactor fuel elements. Barrier effectiveness tests show that 0.2 mil nickel is a minimum for diffusion barrier application. Successful bonds by roll cladding with an electrodeposited nickel bond layer have been produced without deformation of 1 inch x 1 inch x 0.180 inch cores. Deformation of core versus pack has been established for several conditions of core dimension and rolling schedule. Apparatus for a critical extrusion test is being machined. The experiment is planned for late October. Beryllium additions to the AlSi bath suppress drossing, but they have negligible effect on intermetallic compound formation. Corrosion test failures of soldered ribs sprayed with zinc took place in 6 days regardless of solder used. The same ribs sprayed with aluminum are still intact after two weeks. Solder bonding with a flash coating of copper on both core and sheath has been satisfactorily completed with aluminum and uranium.

153 (DPW–53-1343-Del.Ver.) **Summary of irradiation data on U-Al and Li-Al alloys.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 29 Oct 1953. 6p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–876). Order Number DE95002541. Source: OSTI; NTIS; GPO Dep.

This report is a summary of information on the dimensional changes in both U-Al fuel alloys and Li-Al target alloys, both of which are used at the Savannah River Plant. The report summarizes data collected at different labs which sheds light on the magnitude, scaling, and probable causes of such expansion effects.

154 (DPW–54-21-1-Del.Ver.) **Preliminary engineering studies, Savannah River Plant, quarterly report July 1954.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 8 Jul 1954. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–826). Order Number DE95001995. Source: OSTI; NTIS; GPO Dep.

This report is a summary of engineering activities at the Savannah River Plant during the second quarter of 1954, on Authorization projects which require quarterly reporting. Projects are scheduled in the 100 and 200 areas of the plant, dealing with fuel element handling, loading, storage, and process development.

155 (DPW–55-17-15) **Weekly report - 100 Areas - April 14, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 14 Apr 1955. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–906). Order Number DE95002571. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of April 14, 1955. Items discussed include an overview of highlights of a components sub-committee meeting, an overview of an actuator sub-committee meeting, further study on the Formsprag clutch test, discussion on the cooling requirements during shutdown, a review of the moderator purification meeting results, experience with the transfer bucket vibrator on loading four foils in the bucket, and studies of ways to transfer long fuel elements vs. cutting them in the 100 area prior to transport.

156 (DPW–55-17-17) **Weekly report - 100 Areas - April 28, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 28 Apr 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–897). Order Number DE95002562. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of April 28, 1955. Items discussed include receipt of sample Q-foils from a new supplier for evaluation, discussion of safety devices for the reactors which are in process of approval through channels, the detection of severe corrosion on monitor pins, which appears to be the result of manufacturing processes, further review of the proposed moderator circulation upgrade with larger pumps, and extended discussion on the issue of shipping long fuel elements in large casks or cutting before transport.

157 (DPW–55-17-19) **Weekly report - 100 Areas.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 12 May 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–899). Order Number DE95002564. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of May 12, 1955. Discussed in this report are testing results of more quatrefoil extrusions supplied by a potential manufacturer, clogging problems in dual valve strainers, discussion of the style of supplementary safety device to be recommended for poison release valves, summary of work on power perturbations, cooling of septifoils, stress analysis in thermal shields, and design of Formsprag clutches, moderator purification issues including tritium contamination and turbidity, studies of heat generation from used fuel elements after 90 to 120 days of decay, and discussion of possible long casks for shipping long elements.

158 (HAN–93855-Rpt.7-Del.) **200 Area monthly report, July 1966.** Christy, J.T. Hanford Works, Richland, WA (United States). 9 Aug 1966. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94015449. Source: OSTI; NTIS; GPO Dep.

This report details 200 Area activities for the month of July 1966.

0508 Spent Fuels Reprocessing

Refer also to citation(s) 210, 841, 886

159 (AREAEE–288) **Radiolysis of tri-n-butyl phosphate solutions effect of absorbed dose on extractability of uranium fission products and nitric acid.** Souka, N.; Elsweify, F.H.; Eldessouky, A.M.; Abdel Fattah, N. Nuclear Research Centre, Inshas (Egypt). 1985. 16p. Order Number DE95605747. Source: OSTI; NTIS (US Sales Only); INIS.

30% TBP solutions in kerosene, benzene and xylene were γ - irradiated using different exposure doses. The effect of absorbed dose on the extraction of uranium, fission products and H N O_3 was investigated. Based on experimental results the effect of dose on : percentage loading free acidity and decontamination factors were calculated, a comparison between the three extraction systems were presented. 6 tab.

160 (AREAEE–291) **Investigation of the oxidation of hydrochloric acid in scrubbing solutions containing hydrogen peroxide.** Mekhail, F.M. Nuclear Research Centre, Inshas (Egypt). 1986. 20p. Order Number DE95605748. Source: OSTI; NTIS (US Sales Only); INIS.

Oxidation and absorption of nitrogen oxides by a solution containing sulphuric, nitric acids and hydrogen peroxide have been investigated. The oxidation of nitric oxide is dependent among others on hydrogen peroxide concentration total acidity and temperature. The absorption of N O_2 by the scrubbing solution (H_2 S O_4,H N O_3 and H_2 O_2) in all cases studied is not less than 98%. The oxidation of chloride into chlorine gas increases as the concentration of each of hydrochloric acid, nitric oxide and nitric acid increases. On the other hand as the concentration of hydrogen peroxide increases the amount of chlorine gas decreases. The results show that the oxidation of chloride into chlorine gas is mainly due to nitrogen dioxide. 7 fig., 2 tab.

161 (AREAEE–300) **Development of IAEA safeguards at low enrichment uranium fuel fabrication plants.** Badawy, I. Nuclear Research Centre, Inshas (Egypt). 1988. 14p. Order Number DE95605749. Source: OSTI; NTIS (US Sales Only); INIS.

In this report the nuclear material at low enrichment uranium fuel fabrication plants under IAEA safeguards is studied. The current verification practices of the nuclear material and future improvements are also considered. The problems met during the implementation of the the verification measures of the nuclear material - particularly for the fuel assemblies are discussed. The additional verification activities as proposed for future improvements are also discussed including the physical inventory verification and the verification of receipts and shipments. It is concluded that the future development of the present IAEA verification practices at low enrichment uranium fuel fabrication plants would necessitate the application of quantitative measures of the nuclear material and the implementation of advanced measurement techniques and instruments. 2 fig., 4 tab.

162 (AREAEE–301) **A safeguards approach applicable to A plutonium mixed oxide powder plant.** Ismail, B. Nuclear Research Centre, Inshas (Egypt). 1988. 18p. Order Number DE95605750. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes a safeguards approach possible to apply in a plutonium mixed oxide powder plant which handles large amounts of plutonium in the light of experience gained in some other plutonium bulk handling facilities in the nuclear fuel cycle under IAEA safeguards. The approach is based on performing two routine verifications of the nuclear material per month without interrupting the process operations in the plant combined with continual flow verifications for ongoing process and transfer operations; and two physical inventory verifications per year. The total annual effort to cover all the verifications was estimated to be in the range of 150 to 240 man day. The analysis of the approach showed that with further advances in the Non destructive assay measurement techniques for the determination of plutonium content in solutions and MOX powder would lead to development of the approach towards increase in effectiveness and decrease in the verification effort. 2 fig., 4 tab.

163 (CEA-CONF–11801) **The qualitative and fuzzy contributions for industrial process diagnostic. Application in the DIAPASON project.** Montmain, J.; Leyval, L. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. des Procedes de Retraitement. 1993. 7p. (In French). (CONF-9309287–: 4. French congress on process engineering, Grenoble (France), 21-23 Sep 1993). Order Number DE95605751. Source: OSTI; NTIS (US Sales Only); INIS.

In the frame of the DIAPASON project, we have realized a prototype on a spent fuel reprocessing shop. This prototype uses a fuzzy logic for process diagnostic. 12 refs.

164 (CEA-CONF–11802) **To a cooperating approach for plant operator aid.** Penalva, J.M. (CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. d'Exploitation du Retraitement et de Demantelement); Mathieu, D.; Minault, S. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. d'Exploitation du Retraitement et de Demantelement. 1993. 4p. (In French). (CONF-9309287–: 4. French congress on process engineering, Grenoble (France), 21-23 Sep 1993). Order Number DE95605752. Source: OSTI; NTIS (US Sales Only); INIS.

In this article we present the basic principles of a plant aid system for a spent fuel reprocessing shop. These principles are based on a cooperating approach of plant operator aid and on a systemic step SAGACE. 2 figs.

165 (DPW–55-4-6) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 9 Feb 1955. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–900). Order Number DE95002565. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of February 9, 1955. Discussed are operation status in the 200-F area, scoping for additional equipment for the 200 area, including evaporators, vessels, and jumpers, additional service elevator engineering, sampling provisions in the mixer-settlers, leaking shut-off valve seats, provision of office space in 211-H, air conditioning, design work on additional waste storage tanks, and sampler experience on the 221-F B line.

166 (DPW–55-4-7) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 16 Feb 1955. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–901). Order Number DE95002566. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of February 16, 1955. Discussed are the operational status of the 200-F area, pre start-up calibration work in the 200-H area, engineering for an additional service elevator, building changes to support increased capacity, work on the continuous solvent recovery process, solvent evaporators, cold laboratory design, the continuous solvent feed to the mixer-settlers, and design work for installation of solvent filters.

167 (DPW–55-4-12) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 24 Mar 1955. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–873). Order Number DE95002501. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of March 24, 1955. Discussed are operations experience in the 200-F area, changes to original building modification plans for bldg 221-F, design of shielded skimmed solvent filters, redesign of overflow lines for the resin column feed tank, studies on problems with connector gaskets, status of bldg 717, changes to sample door stops, design of a cold feed laboratory, design of a pilot plant for thorium reduction, and preliminary design for a new maintenance and storage facility.

168 (DPW–55-4-13) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 31 Mar 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–864). Order Number DE95002493. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of March 31, 1955. Discussed are operations experience in the 200-F area, pre start-up work in the 200-H area, review of 200-F exception reports, acquisition of a universal jig for mocking up canyon jumpers, and provision of additional condensate quality water to the 211-H building.

169 (DPW–55-4-14) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 7 Apr 1955. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–865). Order Number DE95002494. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plant for the week of April 7, 1955. Discussed are operations experience in the 200-F area, process modifications for the 221-H building, engineering of pumps for the canyons, further study of waste transfer lines, increased capacity changes, shielded solvent filters, installation of a freight elevator, and further work on handling long fuel elements.

170 (DPW–55-4-17) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 28 Apr 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–868). Order Number DE95002502. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of April 28, 1955. Discussed are 200-F area operations experience, design and installation of a water scrub, costing of additional loading facilities, piping selection for cooling uses, storage of coating wastes, progress on additional waste storage tanks, and work on solvent decanters, continuous washers, coupling redesign, and storage of jigs and fixtures for future plant usage.

171 (DPW–55-4-18) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 5 May 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–877). Order Number DE95002542. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of May 5, 1955. Items discussed include 200-F operations experience, work on start-up of 200-H, installation of control systems for a water scrub system, flowsheet design for the rerun station, work on continuous decanters and solvent washers, approval for additional waste tank storage, and construction status for increased capacity installation.

172 (DPW–55-4-19) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 12 May 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–878). Order Number DE95002543. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of May 12, 1955. Items discussed include operations experience for the 200-F area, changes to piping for waste storage facilities, meeting schedule for increasing capacity, provision of additional slug bucket storage space due to increased capacity, and modifications for in-line sampling systems.

173 (DPW–55-4-21) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 26 May 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–879). Order Number DE95002544. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of May 26, 1955. Items discussed in this report include 200-F area operations experience, modifications to impellers in the mixer settlers, changes to the waste water handling system, an order for new pump for the waste pumping facility, preliminary discussion on methods for handling long elements, and engineering on increased capacity.

174 (DPW–55-4-29) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 25 Aug 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–889). Order Number DE95002551. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of August 25, 1955. Discussed are

operations experience in the 200 Area, additional cracking in filter boats, discussion of exception reports on the 200-F area, design of major canyon equipment for capacity increases, designs for additional waste storage tankage, work on high acid waste acid recovery, continuous hot solvent recovery, solvent purification, and canyon pumps for buildings 221-F and 221-H.

175 (DPW–55-4-32) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 11 Aug 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–887). Order Number DE95002552. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report of the 200 Area Solvent Extraction Plants for the week of August 11, 1955. Discussed are activity problems in the 221-F area, increased capacity in the 221-F area, and a summary of new projects for this area, a Nash Exhauster seal liquid system, shielding for the control house, and work in the continuous hot solvent recovery program and high activity waste acid recovery test.

176 (DPW–55-4-33) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 18 Aug 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE95002553. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of August 18, 1955. Discussed in this report are operations experience in the 221-F building, modifications for the 5 ton oxide shipping containers, cracking problems in platinum filter boats, and status of work in the 677 building.

177 (DPW–55-4-34) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 21 Jul 1955. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–886). Order Number DE95002554. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of July 21, 1955. Items touched on are operations experience in the 221 building solvent extraction unit, start-up work in the 200-H area for the new line, engineering for new 5 ton oxide shipping containers, cooling coil additions to waste storage tanks, and work on immediate and longer term process capacity increases.

178 (DPW–55-4-36) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 8 Sep 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–890). Order Number DE95002555. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of September 8, 1955. Items discussed include operations experience in the 200 area, a review of exception reports in the 200-F area, and 200-H area, design work to increase capacity in the 221-F plant, design and vendor selection for pumps for solvent recirculation and waste pumpage.

179 (DPW–55-4-38) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 22 Sep 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–874). Order Number DE95002539. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of September 22, 1955. Areas discussed include engineering on filter boats for the B line, redesign of the support for the hydrofluorination furnaces, general equipment requirements for the increased capacity evaporator in the large canyon, work on the high activity waste recovery test, design for the evaporator for waste concentration efforts, and engineering progress and materials acquistion and construction of pumps for use in the canyons and in waste handling.

180 (DPW–55-4-39) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 29 Sep 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–875). Order Number DE95002540. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of September 29, 1955. This report discusses high activity waste acid recovery test equipment, cost estimates for achieving increased throughput, costing on additional waste storage tanks, siting studies for evaporator location for waste concentration plans, work on solvent purification, and plans for use of the NFE dissolver, which will require longer buckets, and casks for shielding during transport.

181 (DPW–55-4-41) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 13 Oct 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–892). Order Number DE95002557. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of October 13, 1955. Items discussed include operations experience in solvent extraction, preliminary engineering on a waste recovery system for the B line, work on additional waste storage tanks, addition of a second product cycle solvent system, installation of air lifts for solvent recirculation, and engineering work on continuous hot solvent washing.

182 (DPW–55-4-42) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 20 Oct 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–893). Order Number DE95002558. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of October 20, 1955. Items discussed in this report include operating experience of the lines, solvent purification work, fabrication of jumpers, preliminary work on high activity waste acid recovery, engineering for a waste evaporator, and project work on plans for increased capacity modifications.

183 (DPW–55-4-43) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 27 Oct 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–895). Order Number DE95002559. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of October 27, 1955. Items discussed in this report include operations work in the 221-F and 221-H buildings, work on element dissolvers, design and planning work for additional waste storage tankage, shielding for control rooms, design and procurement of extraction furnaces, and review of safety rules on packaging tritium containers.

184 (DPW–55-4-44) **200 Area weekly report.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 3 Nov 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–895). Order Number DE95002560. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 200 Area Solvent Extraction Plants for the week of November 3, 1955. Items discussed include the operations experience in 221-F and 221-H buildings, further study of the NFE dissolver, pumps for the canyon solvent washing systems, acceptance problems with platinum filter boats, and design of product recovery facilities for the H area.

185 (INIS-GB–637) **BNFL Sellafield further public consultation: Summary of responses.** Department of the Environment, London (United Kingdom). 11 Sep 1994. 71p. Order Number DE95603379. Source: OSTI; NTIS (US Sales Only); INIS.

The main issues raised during the further public consultation on the draft Sellafield authorisations for the discharge of radioactive wastes from the British Nuclear Fuel (BNFL) Sellafield site are outlined. An analysis of the categories and numbers of the 42,500 responses is made. The public consultation was based on five documents; a letter to consultees from the Department of the Environment and the Ministry of Agriculture, Fisheries and Food (MAFF); the report by Her Majesty's Inspectorate of Pollution and the Inspectorate of MAFF on their earlier consultation exercise; a paper by BNFL on the economic and commercial justification of the Thermal Oxide Reprocessing Plant (THORP); a statement of the Government's policy on reprocessing and THORP and a document

prepared by BNFL on the environmental implication of THORP. (UK).

186 (WHC-SA–2664) **PUREX irradiated fuel recovery simulation.** Jaquish, W.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9410231–1: 8. Deneb user group meeting, Detroit, MI (United States), 10-14 Oct 1994). Order Number DE95001640. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses the application of IGRIP (Interactive Graphical Robot Instruction Program) to assist environmental remediation efforts at the Department of Energy PUREX Plant at the Hanford Site. An IGRIP simulation was developed to plan, review, and verify proposed remediation activities. This simulation was designed to satisfy a number of unique purposes that each placed specific constraints and requirements on the design and implementation of the simulation. These purposes and their influence on the design of the simulation are presented. A discussion of several control code architectures for mechanical system simulations, including their advantages and limitations, is also presented.

0509 Transport, Handling, and Storage

Refer also to citation(s) 272, 274, 275, 452, 522, 526, 547, 565, 566, 869, 1165, 1429, 1449

187 (CEA-CONF–11793) **New regulation of radioactive materials transport.** Grenier, M. CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire. 1993. 8p. (In French). (CONF-9303194–: Meeting on Protection, Handling, Detection and Safety, Strasbourg (France), 30 Mar - 1 apr 1993). Order Number DE95606399. Source: OSTI; NTIS (US Sales Only); INIS.

In this text we give the modifications bringed to the French regulation to take into account the IAEA recommendations of 1990 and the regulations of the European agreements RID and ADR. 3 figs., 6 refs.

188 (CEA-CONF–11809) **Extension of Fakir, Kahina, a computer code of kinsfolk actinides heat irradiation neutron and activity.** Nimal, J.C. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie); Messaoudi, M.; Zachar, M.; Pujet, D. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie. 1994. 8p. (CONF-940424–: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE95606400. Source: OSTI; NTIS (US Sales Only); INIS.

Spent fuels have to be transported from nuclear reactor to reprocessing plant. About 3000 irradiated fuel assemblies are yearly received by COGEMA from customers throughout the world in the reprocessing plant at LA HAGUE, France. The fuel assemblies are transported by COGEMA for France, by PNTL for Japan and by NTL for the European power plants. Considering the diversity of the actors involved in the transport, reprocessing and disposal, a standardization became necessary. The FAKIR code is a tool to achieve this goal. (authors). 1 fig., 10 tabs., 9 refs.

189 (DOE/FTR–94008730) **Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994.** Johnson, C.S.; Martinez, R.L.; Schoeneman, J.L.; Kidner, R.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94008730. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The installation and testing of a Remote Monitoring System (RMS) was conducted at the Australian Nuclear Science and Technology Organization's (ANSTO) Dry Spent Fuel Storage Facility (Building 27). The official contact person for ANSTO was Mr. K. Veevers. Mr. D. Sorokowski represented the Australian Safeguards Office (ASO). Meetings were conducted on January 31 to discuss the installation schedule for the following two weeks. The RMS was successfully installed and operational in the planned time. The implementation of the RMS demonstrates how a number of technologies can be combined on a network to provide possible new approaches in unattended monitoring of remote facilities. The RMS demonstrates the ability to collect important information about nuclear facilities without on-site inspection. Data about the operation of important key activities, as well as images of those activities, can be stored in a digital data base that can be accessed remotely to determine the status at the remote facility. The RMS also collects the same information and stores it on-site for retrieval by an inspector. The installation has been completed and testing has begun and will continue for several months.

190 (DOE/RL–94-68) **User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations.** Kelly, D.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002477. Source: OSTI; NTIS; INIS; GPO Dep.

The need for developing a user's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in a US Department of Transportation Specification 6M (DOT-6M) packaging was identified by the US Department of Energy (DOE)-Headquarters, Transportation Management Division (EM-261) because the DOT-6M packaging is widely used by DOE site contractors and the DOE receives many questions about approved packaging configuration. Currently, EM-261 has the authority to approve new DOT-6M packaging configurations for use by the DOE Operations Offices. This user's guide identifies the DOE-approved DOT-6M packaging configurations and explains how to have new configurations approved by the DOE. The packaging configurations described in this guide are approved by the DOE, and satisfy the applicable DOT requirements and the identified DOE restrictions. These packaging configurations are acceptable for transport of Type B quantities of radioactive and fissile material, including plutonium.

191 (DOE/RW–0431) **Spent fuel storage requirements 1993–2040.** USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States). Sep 1994. 190p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002271. Source: OSTI; NTIS; INIS; GPO Dep.

Historical inventories of spent fuel are combined with U.S. Department of Energy (DOE) projections of future discharges from commercial nuclear reactors in the United States to provide estimates of spent fuel storage requirements through the year 2040. The needs are estimated for storage capacity beyond that presently available in the reactor storage pools. These estimates incorporate the maximum capacities within current and planned in-pool storage facilities and any planned transshipments of spent fuel to other reactors or facilities. Existing and future dry storage facilities are also discussed. The nuclear utilities provide historical data through December 1992 on the end of reactor life are based on the DOE/Energy Information Administration (EIA) estimates of future nuclear capacity, generation, and spent fuel discharges.

192 (IAEA-TECDOC–759) **Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 151p. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

The Technical Committee Meeting (TCM) on Away-from-Reactor Storage Concepts and their Implementation held in Vienna from 15 to 18 March 1993, gathered representatives of most of the countries operating nuclear power plants. The away-from-reactor (AFR) storage is spent fuel storage outside a reactor site boundary, normally involving receipt and interim storage of irradiated fuel from several nuclear power plants. In particular this might include casks, vaults or modular dry storage facilities at the site of a nuclear power plant, or also the storage pools constructed at a reprocessing plant. The TCM considered four current issues related to AFR: Current status of AFR; AFR technology evaluation and selection

criteria; anticipated future developments; possible international activities in the area of AFR storage of spent fuel and initiatives of the IAEA on this subject. Refs, figs and tabs.

193 (IAEA-TECDOC–759, pp. 13-15) **Spent fuel management and disposal programme (SFMDP) strategy for the Czech Republic.** Soucek, B. (Czech Power Board, Prague (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Storage and disposal of spent fuel from nuclear power reactors in former Czechoslovakia was based on a long-standing agreement that the fuel supplier, the former USSR, would take it back. This situation is no longer an option after political and economic changes which took place in 1989. All spent fuel burned in the Czech nuclear reactors remains in the country. The electric utility, the Czech Power Board - the producer of spent fuel - is, according to the legislation, responsible for handling and storing of the burned fuel. Therefore the Czech Power Board convened a team of international experts whose objective was to prepare a draft on national strategies for the SFMDP in the Czech Republic. The paper gives a brief overview of the results of the analysis of the policy alternatives which were recommended by the mission of international experts. The strategy recommended by this mission which will be further elaborated by the Czech authorities, the utilities and other organizations can be considered a basis for the planning and establishing of the future Czech SFMDP. (author).

194 (IAEA-TECDOC–759, pp. 21-23) **Safety features of proposed concepts for spent fuel dry interim storage.** Kirchner, B. (Transnucleaire, 75 - Paris (France)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Whichever solution is selected for the back-end of the fuel cycle, increasing quantities of spent fuel have often to be stored interim for rather long periods of time. Public acceptance of the corresponding storage facilities becomes more and more an important concern for all involved utilities in various countries. The fact that several governments have already issued sets of storage criteria which show significant differences with each other constitutes a weakness for all of them in front of their own population which no longer knows whom to believe. Therefore the need of an international consensus on basic rules and criteria for the safe interim storage of spent fuel has now become really urgent. The paper gives a brief view on this problem. (author).

195 (IAEA-TECDOC–759, pp. 25-28) **Study on the design of new spent fuel intermediate storage facilities in France.** Portal, R. (Electricite de France (EDF), 75 - Paris (France)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

The French utility is examining possible new installations to extend its present intermediate nuclear spent fuel storage capacities. Large capacity central facilities are being studied: both ponds and dry intermediate storage installations. These facilities need to be able to serve as a buffer between the power stations and the reprocessing plant. Their initial capacity is 12,000 PWR spent fuel assemblies. The lifetime of the installations is fixed at 50 years. The fuel from the reactors is transported by rail, at a rate of no more than six packages (each containing 12 fuel assemblies) per week. 1800 assemblies (of which 256 MOX fuel assemblies) can be accepted in one year. The spent fuel is sent to the reprocessing plant in transport packages (of a maximum unit capacity of 24 assemblies) compatible with the reception facilities at the plant. Decentralized auxiliary solutions, such as increasing the capacity of the ponds at certain units, storage in dual purpose transport/storage packagings, etc., are also being studied. (author).

196 (IAEA-TECDOC–759, pp. 29-39) **CASCAD dry storage concept for spent fuel.** Singer, B. (Societe Generale pour les Techniques Nouvelles (SGN), 78 - Saint-Quentin-en-Yvelines (France)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Further to a cost-benefit analysis of the various medium-term and long-term and H.L.W. storage possibilities, C.E.A. (French Atomic Energy Commission) and S.G.N. decided to develop an original dry storage process with natural convection cooling that offers many advantages: cut in the total investment and operating costs; high operating safety; natural convection cooling; existence of two containment barriers irrespective of the assumed clad conditions; flexible, modular and compact design. The process was first implemented in the so-called CASCAD Cadarache Facility (vault-type facility) constructed in Cadarache mainly to store fuel from Brennilis heavy water reactor. For the purpose, a large program was set up to develop and validate computer codes, in particular with the use of mockups. On the request of many clients, and owing to the outstanding operating results of the CASCAD Cadarache Facility, SGN was brought to adapt the process to the storage of other types of fuel: LWR, PWR, BWR, MOX/High burn up; WWER 440 and WWER 1000; RBMK. Our paper highlights the main features of: the CASCAD design; the operating experience from the CASCAD Cadarache Facility; the adaptation of the CASCAD process to the above-listed types of fuel. (author).

197 (IAEA-TECDOC–759, pp. 41-56) **AFR storage in Germany - Possibilities and prospects.** Peehs, M. (Siemens AG/KWU, Erlangen (Germany)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

In Germany there are LWR's in operation with an electrical output of 22300 MWe. The spent fuel arisings amount to 3600 tU. 3000 tU thereof are transported to reprocessing facilities. 600 tU spent FA are still remaining in different reactor pools. However the available storage capacities ARS are altogether 4100 tU and the AFR capacities add up to 3000 tU. The concept for AFR storage in Germany is dry storage in He. The decision for the storage mode was based on detailed assessments on safety, reliability and economy. A broad R and D-programme was performed to investigate all relevant phenomena and to demonstrate the dry storage in the CASTOR-and TN-casks in support of the licensing procedure. Dry storage facilities based on transport and storage casks are built in Gorleben and in Ahaus each with a capacity of 1500 tU. In parallel SIEMENS has developed the FUELSTORE which is a bunker type AFR-storage facility. It shows a modular design and can be built with storage capacities ranging from 200 tU to over 3000 tU depending on the request. The spent FA are embottled in SS-canisters which can be placed in the storage vault. The FUELSTORE offers inherent safeguards and protection against man-made ore natural events. It can safely store fuel for a long time without surveillance since it is a passive system. It is fully independent from a reactor and fuel pools. (author). 14 figs, 3 tabs.

198 (IAEA-TECDOC–759, pp. 57-66) **Selection of the type of spent fuel storage at Paks NPP.** Buday, G. (NPP Paks, Paks (Hungary)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage*

concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993. 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

There are many nuclear power plants in the world, that have changed the back-end strategy of their fuel cycle already during operation. Among them is NPP Paks, which is forced to solve the problem of its spent fuel if the possibility of shipping it back to Russia will be ceased. Investigating all the potential alternatives for Paks specific case a decision was made to make preparation for erection of an intermediate on-site spent fuel store. This decision leaves the fuel cycle back-end open until establishment of the long term strategy. In the nuclear business there are many different types of intermediate stores for spent nuclear fuel. Almost all of them have been licensed in one or more countries. The already constructed ones can be considered as industrial references. There is no single right way for selection the best storage concept for an actual NPP, a number of conditions are to be taken into account, e.g. the type of the (spent) fuel, its burn-up level, the site conditions and other specific items. For any NPP, intending to select the type of the spent fuel store, the experience gained at NPP Paks, during this selection might be of great importance. In the present paper this selection process is described: The determination of the content of the Feasibility Study, required from the vendors; the methodology of the evaluation of the different studies. In the paper the result of this process is given, highlighting those aspects on which the selection was based. (author). 2 figs.

199 (IAEA-TECDOC–759, pp. 67-78) **R and D on spent fuel storage in Japan.** Saegusa, T. (Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan)); Nagano, K.; Yamakawa, H.; Mayuzumi, M.; Kato, O.; Ito, C.; Arai, T.; Shirai, K.; Shiomi, S. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

In Japan, spent fuel storage will be licensed in the near future and the related R and D works (partly of the Japanese Government) have been carried out mainly by CRIEPI. This paper describes the results and ongoing or future program of R and D on spent fuel storage. Major results are "Economic Comparison of Various Spent Fuel Storage Methods", "Experimental Results on Cask Storage Method", and "Security on Merit of Burn-up Credit for Cask Storage". In particular, detail of the experimental results on cast storage method will be presented in the following area: (1) Temperature Analysis and Tests of Fuel Cladding, (2) Creep Test of Fuel Cladding, (3) Containment Test of Cask Lid Structure, (4) Cask Drop Test, (5) Material Testing of Ductile Cast Iron Cask, (6) Building Collapse and Heavy Objects Drop Accident onto Cask, (7) Cask Toppling by Earthquake. The ongoing or future program of R and D include experiments on passive cooling of dry storage facility and experiments related to improvement of technology to store high burn-up spent fuel and Pu-Mox spent fuel from light water reactors. (author). 18 refs, 14 figs, 3 tabs.

200 (IAEA-TECDOC–759, pp. 79-89) **Away-from-reactor (AFR) storage concepts - The Indian experience.** Seetharamaiah, P. (Bhabha Atomic Research Centre, Bombay (India). Fuel Reprocessing Div.). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Spent Fuel Management (SFM) has been one of the most important steps in the entire nuclear fuel cycle and it is still one of the most vital and common problems of all the countries having significant reactor power programmes. The Indian Nuclear Programme has considered the vital role of the SFM from the beginning and due consideration was given to develop and adopt programme to tackle this problem. Fuel storage pools of adequate capacity have been built at reactors (AR) and the spent fuel was subsequently taken up for reprocessing. The spent fuel arisings at the BWRs at Tarapur are kept under continued storage over the last two decades resulting in shortage of storage capacity. Away from reactor (AFR) wet storage facility has now been built and commissioned at Tarapur to have adequate storage capacity for the two BWRs. A brief description of the design, construction, safety features and operational experience of this AFR facility is given in this paper. (author).

201 (IAEA-TECDOC–759, pp. 91-93) **Current status of spent fuel management in the Republic of Korea and design concept of the interim spent fuel storage facility.** Park Seongwon (Korea Atomic Energy Research Inst., Daeduk (Korea, Republic of)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Korea now has a well advanced nuclear power programme. Nine nuclear power plants are in operation and seven more are under construction. It is planned that twenty seven nuclear power plants with a total generating capacity of over 23,000 MWe will be in operation by the year 2006. Such a growth of nuclear power programme causes rapid increase of spent fuel generation. Consequently, reliable and effective management of spent fuel has become a key factor for the continued growth of the nuclear power programme. (author). 3 tabs.

202 (IAEA-TECDOC–759, pp. 95-96) **Current situation of spent fuel management in the Laguna Verde Nuclear Power Plant, Veracruz, Mexico.** Moreno, C.V. (Permanent Mission of Mexico, Vienna (Austria)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

The Comision Federal de Electricidad (CFE), owner and operator of the Laguna Verde nuclear power plant (2 x 654 MWe BWR), has twice decided to increase the storage capacity of the spent fuel pools of the reactors. The Comision Nacional de Seguridad Nuclear y Salvaguardias (CNSNS), the national nuclear regulatory authority, approved the increase by a factor of 2.66 in the storage capacity proposal by CFE in 1989. Each reactor spent fuel pool can now hold 614 t HM. The reracking was done at a cost of about US $13 per kg U, which will add only 0.042 mills per kWh to the fuel cycle cost. (author).

203 (IAEA-TECDOC–759, pp. 97-105) **Spent fuel management in the Slovak Republic.** Turner, M. (Slovak Power Enterprise, Bratislava (Slovakia). Nuclear Fuel Div.). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper the present and the future spent fuel management in the Slovak utility - Slovak Power Enterprises (SEP) is presented. The annual arising of spent fuel in The Slovak Republic is approximately 40 MtHm. The average burn-up is 32 GWd/TU. Since the first unit started operating in 1978 an amount of 400 MtHM have been generated and will reach 860 MtHM by the year 2000. In the past the spent fuel management based on the assumption, that all spent fuel from WWER reactors will be transported to the reprocessing plant in Russia. After the political changes in the former USSR no spent fuel transports from Slovakia were realized. Only a small amount of the generated WWER spent fuel was transported

to the reprocessing plant in Russia. The rest is stored on the territory of the NPP Bohunice in the reactor pools or in the AFR storage. (author). 9 figs.

204 (IAEA-TECDOC–759, pp. 107-117) **Comparison of different calculational methods for spent fuel storage criticality calculations.** Ravnik, M.; Kromar, M.; Remec, J.; Trkov, A. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Comparison of different methods for the spent fuel pool criticality calculations is presented. The work was stimulated by the NRC Information Notice 92-21 about errors and uncertainties found in criticality calculations of spent fuel pools where strong neutron absorbers (Boraflex) are implemented. Three different methods are compared: Monte Carlo (KENO-IV), deterministic transport (DOT) and diffusion approximation (CORD-2). Practical results for a typical PWR pool-type spent fuel storage with dense racks are presented. The discrepancies between different methods are analyzed. (author). 12 refs, 5 figs, 2 tabs.

205 (IAEA-TECDOC–759, pp. 119-135) **Progress with Scottish Nuclear's proposals for the construction of dry fuel stores at Torness and Hunterston 'B' power stations.** Cathro, I.S. (Scottish Nuclear Ltd., Glasgow (United Kingdom)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

Scottish Nuclear's largest single operating cost is that associated with reprocessing of spent fuel. It constitute over 20% of the total costs. Scottish Nuclear therefore initiated a thorough examination of the alternative technical options to reprocessing, in respect of AGR spent fuel. Scottish Nuclear has assessed the likely economic impact of choosing to store its spent fuel prior to eventual direct disposal to a suitable repository as an alternative to immediate reprocessing. A formal applications to construct a dry fuel store at Torness was lodged with the Secretary of State for Scotland on 1 May 1992. In the period up to the Secretary of State decision, Scottish Nuclear are continuing with the detailed design development in conjunction with the proposed managing contractor for the project, GEC Alsthom. (author). 3 figs.

206 (IAEA-TECDOC–759, pp. 137-147) **Monitored retrievable storage facility conceptual design.** Stringer, J.B. (Duke Engineering and Services, Inc., Charlotte, NC (United States)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

The United States Congress has enacted legislation directing the Department of Energy to take title to and dispose of high level nuclear waste. As part of a contract which resulted from this act, a conceptual design for a Monitored Retrievable Storage facility has been completed. This paper presents the results of that conceptual design. Six design concepts were investigated for handling and storing spent nuclear fuel assemblies from commercial reactors. All six of these design concepts satisfy program requirements and provide safe and efficient methods to handle and store spent nuclear fuel. Provided in this paper is an overview of the basis for conceptual design, a discussion of the function and purpose of the MRS, schedule information, and discussions of the six design concepts. This conceptual design is an important step towards furthering the civilian radioactive waste management system program. (author). 2 figs, 1 tab.

207 (INIS-JP–018, pp. 549-556) **Thermal test and analysis of a spent fuel storage cask.** Yamakawa, H. (Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan). Abiko Research Lab.); Gomi, Y.; Ozaki, S.; Kosaki, A. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

A thermal test simulated with full-scale cask model for the normal storage was performed to verify the storage skill of the spent fuels of the cask. The maximum temperature at each point in the test was lower than the allowable temperature. The integrity of the cask was maintained. It was observed that the safety of containment system was also kept according to the check of the seal before and after the thermal test. Therefore it was shown that using the present skill, it is possible to store spent fuels in the dry-type cask safely. Moreover, because of the good agreement between analysis and experimental results, it was shown that the analysis model was successfully established to estimate the temperature distribution of the fuel cladding and the seal portion. (J.P.N.).

208 (SAND–93-0737) **MELTER: A model of the thermal response of cargos transported in the Safe-Secure Trailer subject to fire environments for risk assessment applications.** Larsen, M.E. Sandia National Labs., Albuquerque, NM (United States). Aug 1994. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94018516. Source: OSTI; NTIS; INIS; GPO Dep.

MELTER is an analysis of cargo responses inside a fire-threatened Safe-Secure Trailer (SST) developed for the Defense Program Transportation Risk Assessment (DPTRA). Many simplifying assumptions are required to make the subject problem tractable. MELTER incorporates modeling which balances the competing requirements of execution speed, generality, completeness of essential physics, and robustness. Input parameters affecting the analysis include those defining the fire scenario, those defining the cargo loaded in the SST, and those defining properties of the SST. For a specified fire, SST, and cargo geometry MELTER predicts the critical fire duration that will lead to a failure. The principal features of the analysis include: (a) Geometric considerations to interpret fire-scenario descriptors in terms of a thermal radiation boundary condition, (b) a simple model of the SST's wall combining the diffusion model for radiation through optically-thick media with an endothermic reaction front to describe the charring of dimensional, rigid foam in the SST wall, (c) a transient radiation enclosure model, (d) a one-dimensional, spherical idealization of the shipped cargos providing modularity so that cargos of interest can be inserted into the model, and (e) associated numerical methods to integrate coupled, differential equations and find roots.

209 (WHC-SD-TP-UM–002-Rev.1) **Automated Transportation Management System (ATMS) user's manual: Revision 1.** Smith, P.D. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002278. Source: OSTI; NTIS; INIS; GPO Dep.

The Automated Transportation Management System (ATMS) Software User Guide (SUG) constitutes the user procedures for the ATMS System. Information in this document will be used by the user to operate the automated system. It is intended to be used as a reference manual to guide and direct the user(s) through the ATMS software product and its environment. The objectives of ATMS are as follows: to better support the Procurement function with freight rate information; to free Transportation Logistics personnel from routine activities such as the auditing and input of freight billing information; to comply with Headquarters Department of Energy-Inspector General (DOE-IG) audit findings to automate transportation management functions; to reduce the keying of data into the Shipment Mobility Accountability Collection (SMAC) database; and to provide automation for the preparing of Bill of Lading, Declaration of Dangerous Goods, Emergency Response Guide and

shipping Labels using HM181 Retrieval of hazardous material table text information.

210 (WSRC-MS–94-0284) **Experiences in the dry storage of aluminum-clad spent nuclear fuels.** Duignan, M.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941235–1: Spent nuclear fuel: challenges and initiatives, Sun Valley, ID (United States), 14-16 Dec 1994). Order Number DE95000757. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of an investigation carried out to determine experiences in the dry storage of aluminum-clad spent nuclear fuels. DOE's renewed policy to receive spent fuels from Foreign Research Reactors (FRR) creates a need for temporary storage that could last from a few years to several decades, until a permanent repository is constructed. The Westinghouse Savannah River Company is evaluating options to reprocess or store FRR spent fuels and a strong, economical candidate is dry storage. The Experimental Thermal Fluids group of WSRC has been tasked to develop the thermal-hydraulic analyses of several dry storage concepts. Part of that task is to determine past experiences in the dry storage of aluminum-clad fuel, of which the majority of FRR spent fuels are comprised. The basic finding was that, while there is some experience, around the world in the dry storage of aluminum-clad fuels, it is limited to a few specific fuel types in only a handful of countries. There are many countries that use and store nuclear fuels, and of these at least 28 countries use some type of aluminum-based fuels. Furthermore, at least 13 countries have some experience in the dry storage of nuclear fuels, but only 4 countries have been found that have experience with Al-clad fuels: Australia (Tube and some MTR types), Canada (Pin type), Japan (Pin type), and the USA (MTR type). The dry-storage experiences of those countries are outlined.

211 (WSRC-MS–94-0563) **Characterization of aluminum clad fuels and targets for long-term storage.** Louthan, M.R. Jr. (Savannah River Technology Center, Aiken, SC (United States). Materials Technology Section); Iyer, N.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941207–13: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95002692. Source: OSTI; NTIS; INIS; GPO Dep.

Dry storage of aluminum clad spent fuels and targets is currently being considered as an alternative to the reprocessing technologies which have been used throughout the DOE complex. Reprocessing technologies typically provided the fuel and target handling practices designed for short term (months) basin storage to provide cooling prior to dissolution, separation, recovery and treatment of the radionuclides. The halt in reprocessing and transition from short term storage to continued wet storage of the fuels has led to corrosion induced degradation of the fuels and an increase in the required fuel characterization. This paper summarizes the results of the Savannah River Site efforts to develop characterization requirements for aluminum clad spent nuclear fuels and targets. Emphasis is placed on aluminum clad, aluminum-uranium alloy core assemblies and the impact of minor cladding penetrations on interim dry storage requirements.

212 (WSRC-TR–94-0184-Del.Ver.) **Drum investigation committee final report.** Cato, D.M. Westinghouse Savannah River Co., Aiken, SC (United States). 7 Apr 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95003109. Source: OSTI; NTIS; INIS; GPO Dep.

On 10/20/92, a drum located in the R Area Heavy Water Storage Facility 122-R, was found to be leaking. The leak resulted in the loss of over 200 pounds of degraded moderator (20% D_2O). Following this failure, a review was initiated to determine visual leakage from the remaining drums within the 122-R storage facility. This review identified three additional drum with visual indications of leakage. The initial event was classified as an Off Normal Event. Part of the corrective actions for the event was the creation of the Heavy Water Drum Investigation Committee. The charter of the committee was to: Perform a historical review of drum failures; Determine the number of drums in storage and their current locations; Determine the age of the drum population; Investigate drums having suspect chemistry; Review the conditions of the current storage facilities; Review the current inspection criteria and provide improvement recommendations; Determine the adequacy of the storage level requirements; and Determine the failure mode of the failed drums. This report documents the findings and recommendations of the Drum Investigation Committee.

0510 Economic, Industrial, and Business Aspects

Refer also to citation(s) 535, 933, 937

213 (WHC-SP–1096) **Planning integration FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP).** Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 937p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001249. Source: OSTI; NTIS; INIS; GPO Dep.

This Multi-Year Program Plan (MYPP) for the Planning Integration Program, Work Breakdown structure (WBS) Element 1.8.2, is the primary management tool to document the technical, schedule, and cost baseline for work directed by the US Department of Energy (DOE), Richland Operations Office (RL). As an approved document, it establishes a binding agreement between RL and the performing contractors for the work to be performed. It was prepared by the Westinghouse Hanford Company (WHC) and the Pacific Northwest Laboratory (PNL). This MYPP provides a picture from fiscal year 1995 through FY 2001 for the Planning Integration Program. The MYPP provides a window of detailed information for the first three years. It also provides 'execution year' work plans. The MYPP provides summary information for the next four years, documenting the same period as the Activity Data Sheets.

214 (WHC-SP–1110) **Analytical services FY 1995 multi-year program plan fiscal year work plan, WBS 1.5.1.** Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 487p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003047. Source: OSTI; NTIS; GPO Dep.

The Hanford Analytical Services Program supports the Hanford mission by providing high quality analytical chemistry and process development services meeting client requirements. This report describes the various technical functions and requirements necessary to carry out these support objectives. Program baselines are described in Section 2 which includes a listing of resource allocation by activity. Section 3 contains the fiscal year work plan which lists the operating expenses.

0520 Waste Management

Refer also to citation(s) 165, 170, 171, 174, 177, 181, 182, 183, 193, 469, 470, 489, 496, 498, 503, 511, 513, 516, 518, 519, 520, 521, 528, 529, 530, 531, 532, 533, 556, 559, 567, 579, 788, 841, 906, 938, 943, 955, 958, 1153, 1290, 1333, 1457, 1577, 1676, 1774, 1785, 1824, 1833, 1836, 1837, 1838, 1859, 1916, 2487, 2514, 2522

215 (ABB-ATOM-SDB–93-1288(rev.)) **Methods for estimating the content of transuranium and other difficult to measure nuclides in produced rad waste from BWRs.** Ingemansson, T. ABB Atom AB, Vaesteraas (Sweden). May 1994. 93p. Order Number DE95606775. Source: OSTI; NTIS; INIS.

During operation of nuclear power reactors a large number of radionuclides are produced. Some of them are difficult to measure. These are alpha or beta emitting radionuclides with weak or no gamma transition(s). A number of them, for instance some of the transuranium isotopes, may have significant radiological impact. It is of interest to be able to estimate the activity levels of these nuclides in the reactor systems. It is also of significant importance to estimate their content in produced waste packages and their radiological impact. In the report sources and source strengths for uranium and transuranium isotopes as well as for selected activated corrosion products are provided. Models for estimating the

activity levels of these nuclides in the reactor systems and in different waste types are proposed. It is shown that the only significant source of uranium and transuranium nuclides is dispersion of fuel during operation of a reactor with defected and degrading fuel. The total amount of uranium on the core surfaces (tramp uranium), for a reactor in which no severe fuel failures have occurred, is about 0.5 g U, containing 2 % fissile material. During operation with defected fuel, up to 400 g U has been dispersed in the reactor water and distributed in the primary system during one single fuel cycle. Models for estimations of the amount of tramp uranium on the core surfaces during operation with no defected rods and the accumulation of uranium during operation with degrading fuel are provided. These models form the basis for consequence analyses of fuel failures and estimations of the amount of alpha emitting nuclides in different types of waste. 19 refs.

216 (ANL–94/19) **ANL Technical Support Program for DOE Environmental Restoration and Waste Management: Annual report, October 1992–September 1993.** Bates, J.K. (and others); Bourcier, W.L.; Bradley, C.R. Argonne National Lab., IL (United States). Jun 1994. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94017954. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an overview of the progress during FY 1993 for the Technical Support Program that is part of the ANL Technology Support Activity for DOE Environmental Restoration and Waste Management (EM). The purpose is to evaluate, before hot start-up of the Defense Waste Processing Facility (DWPF) and the West Valley Demonstration Project (WVDP), factors that are anticipated to affect glass reaction in an unsaturated environment typical of what may be expected for the candidate Yucca Mountain repository site. Specific goals for the testing program include the following: reviewing and evaluating available data on parameters that will be important in establishing the long-term performance of glass in a repository environment; performing tests to further quantify the effects of important variables where there are deficiencies in the available data; and initiating long-term tests to determine glass performance under a range of conditions applicable to repository disposal.

217 (ANL/CMT/PP–78044) **Effects of glass surface area-to-solution volume ratio (S/V) on glass dissolution: Part one: Relationship between S/V and leachate pH.** Feng, X. (Argonne National Lab., IL (United States). Chemical Technology Div.); Pegg, I.L. Argonne National Lab., IL (United States). Chemical Technology Div.; West Valley Nuclear Services Co., Inc., West Valley, NY (United States). Nov 1992. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38 ; AC07-81NE44139. Order Number DE95002901. Source: OSTI; NTIS; INIS; GPO Dep.

The observed relationship between S/V and leachate pH is discussed in terms of a simple model of the glass dissolution process. Data from leach tests on several nuclear waste glass compositions at different S/V ratios show that the leachate pH increases with time and then stabilizes at a nearly constant value beyond about 28 days. This stabilized pH increases systematically with the S/V ratio of the test. The model developed here reproduces the essential features of the data and suggests that a single parameter describing the intrinsic rate of alkali diffusion and ion exchange from the glass is sufficient to represent the major glass composition dependence. Interestingly, the results are essentially independent of the rate constant for matrix dissolution. This study suggests that the diffusion-ion exchange process is central in determining the solution pH and its dependence on S/V and the glass reaction, at least under static or low-flow-rate test conditions, is driven by alkali release.

218 (ANL/EAD/LD–2) **Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0.** Yu, C. (and others); Zielen, A.J.; Cheng, J.J. Argonne National Lab., IL (United States). Sep 1993. 334p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94015594. Source: OSTI; NTIS; INIS; GPO Dep.

This manual presents information for implementing US Department of Energy (DOE) guidelines for residual radioactive material. It describes the analysis and models used to derive site-specific guidelines for allowable residual concentrations of radionuclides in soil and the design and use of the RESRAD computer code for calculating doses, risks, and guideline values. It also describes procedures for implementing DOE policy for reducing residual radioactivity to levels that are as low as reasonably achievable. Two new pathways, radon inhalation and soil ingestion, have been added to RESRAD. Twenty-seven new radionuclides have also been added, and the cutoff half-life for associated radionuclides has been reduced to six months. Other major improvements to the RESRAD code include the ability to run sensitivity analyses, the addition of graphical output, user-specified dose factors, updated databases, an improved groundwater transport model, optional input of a groundwater concentration and a solubility constant, special models for tritium and carbon-14, calculation of cancer incidence risk, and the use of a mouse with menus.

219 (ANL/ET/CP–83175) **Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization.** Wagh, A.S.; Singh, D. Argonne National Lab., IL (United States). Energy Technology Div. Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940983–4: 2. international symposium and exhibition on environmental contamination in Central and Eastern Europe, Budapest (Hungary), 20-23 Sep 1994). Order Number DE95002904. Source: OSTI; NTIS; INIS; GPO Dep.

Chemically bonded phosphate ceramics (CBCs) were investigated for low-temperature stabilization and solidification of DOE mixed wastes where conventional high-temperature treatments cannot be used due to presence of volatiles and pyrophorics in the wastes. This article deals with stabilization of chemical contaminants. Phosphate ceramics of Mg, Mg-Na and Zr are being investigated as candidate materials. The authors discuss the basic properties of the phosphate waste forms made with surrogates of typical DOE mixed wastes with an emphasis on ash waste stream. The performance of the final waste forms, including leachability of the contaminants durability of the final waste forms in aqueous environment, and strength of the waste forms are discussed in detail. Based on the results, the authors present possible economic applications of these materials.

220 (ANL/RE/PP–79448) **Effect of gravitation on dynamic response of tanks containing two liquids.** Tang, Yu. Argonne National Lab., IL (United States). [1994]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE94016896. Source: OSTI; NTIS; GPO Dep.

The exact solution to the dynamic response of circular cylindrical tanks containing two liquids, considering the gravitational (g) effect at the interface of the two liquids, is presented. Only rigid tanks were studied. The solution is expressed as the superposition of the so-called impulsive and convective solutions. The results are compared with those obtained by neglecting the gravitional effect at the interface to elucidate the g effect and with those of the tanks containing only one liquid to elucidate the effect of the interaction between two liquids. The response functions examined include the hydrodynamic pressure, base shear, base moments, sloshing motions at surface and at the interface of two liquids and the associated sloshing frequencies. It is found that there are two natural frequencies associated with each sloshing mode in contrast to only one frequency associated with each sloshing mode if the g effect at the interface is neglected; also, the convective pressure has a jump at the interface of two liquids, whereas the impulsive pressure is continuous at the interface. Further, it is shown that in a tank containing two liquids the maximum sloshing wave height may increase significantly, and the fundamental frequency of the sloshing motion is lower than that of an identical tanks filled with only one liquid. Additionally, the well-known mechanical model for tanks containing one liquid is generalized for tanks containing two liquids.

221 (CEA-CONF–11787) **Determination of the neutron and gamma dose rates and heatings induced by radioactive wastes in repository geological salt formations.** Bresard, I. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie); Diop, C.M.; Nimal, J.C.; Palut, J.M.; Potier, J.M. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie. 1994. 7p. (CONF-940424–: 8. international conference on radiation

shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE95606783. Source: OSTI; NTIS (US Sales Only); INIS.

In the frame of two CCE working projects called the High Active Waste (HAW) program and the Active Handling Experiment (AHE) program, German Institutes and Companies (GSF, KfK, DBE) and CEA-ANDRA lead a collaboration on the subject of a final disposal in salt formation. The two studies concern the same geological configuration: the ASSE salt mine in Germany. But, the purposes are different and complementary. In the HAW project, the study relates to the feasibility in the geological point of view, of a high level radioactive wastes final disposal. The purpose of the calculations is to obtain the information on the effects of the gamma radiation in the salt (gases formation by radiolysis, thermomechanical modifications of the rock...). The informations given are the dose rate and heating levels induced by the different gamma rays. A physical study has been led to well define the gamma source term taking into account the bremsstrahlung phenomena linked to the different beta emission. The AHE project concerns the handling and the repository aspects of spent fuel which was not processed. It means the feasibility of the program, in the radioprotection point of view. The effect of the neutron wall gallery backscattering phenomena, on the dose rate level, was studied. An experiment is being elaborated in the ASSE mine which the measurement results will be compared with the calculation ones. A good agreement will allow to apply this calculation scheme in the real planned disposal configurations. (authors). 6 figs., 2 tabs., 5 refs.

222 (CEA-CONF–11800) **Systemic representation of a production system: the Sagace method.** Benkhannouche, S.; Penalva, J.M. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. d'Exploitation du Retraitement et de Demantelement. 1993. 6p. (In French). (CONF-9309287–: 4. French congress on process engineering, Grenoble (France), 21-23 Sep 1993). Order Number DE95606776. Source: OSTI; NTIS (US Sales Only); INIS.

The systemic approach used in this study is devoted at a high level radioactive waste vitrification pilot. The Sagace method permits to realize a global view of this pilot plant taking in account the process, the production subsystems and the control process subsystems. 4 figs., 4 refs.

223 (CONF-940225–121) **Uranium removal from soils: An overview from the Uranium in Soils Integrated Demonstration program.** Francis, C.W. (Oak Ridge National Lab., TN (United States)); Brainard, J.R.; York, D.A.; Chaiko, D.J.; Matthern, G. Oak Ridge National Lab., TN (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94017705. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated approach to remove uranium from uranium-contaminated soils is being conducted by four of the US Department of Energy national laboratories. In this approach, managed through the Uranium in Soils Integrated Demonstration program at the Fernald Environmental Management Project, Fernald, Ohio, these laboratories are developing processes that selectively remove uranium from soil without seriously degrading the soil's physicochemical characteristics or generating waste that is difficult to manage or dispose of. These processes include traditional uranium extractions that use carbonate as well as some nontraditional extraction techniques that use citric acid and complex organic chelating agents such as naturally occurring microbial siderophores. A bench-scale engineering design for heap leaching; a process that uses carbonate leaching media shows that >90% of the uranium can be removed from the Fernald soils. Other work involves amending soils with cultures of sulfur and ferrous oxidizing microbes or cultures of fungi whose role is to generate mycorrhiza that excrete strong complexers for uranium. Aqueous biphasic extraction, a physical separation technology, is also being evaluated because of its ability to segregate fine particulate, a fundamental requirement for soils containing high levels of silt and clay. Interactions among participating scientists have produced some significant progress not only in evaluating the feasibility of uranium removal but also in understanding some important technical aspects of the task.

224 (CONF-940225–123) **Oak Ridge background soils project provides data for remedial action evaluation.** Watkins, D.R. (Oak Ridge National Lab., TN (United States)); Lee, S.Y.; Hatmaker, T.L.; McGinn, C.W.; Nourse, B.D.; Schmoyer, R.L.; Burgoa, B.B.; Lietzke, D.A. Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '94; Tucson, AZ (United States); 27 Feb - 3 mar 1994. Order Number DE94017866. Source: OSTI; NTIS; INIS; GPO Dep.

Many constituents of potential concern for human health occur naturally at low concentrations in soils. The primary objective of the Background Soil Characterization Project (BSCP) was to provide fully validated and defensible, reservation-wide background concentration data on significant potential contaminants of concern (organics, inorganics, and radionuclides) in natural soils on the Oak Ridge Reservation (ORR). The data are particularly significant for remedial action projects; the data can be used to establish technical guidance and the basis for realistic cleanup requirements at hazardous waste sites on the reservation. Other objectives included providing baseline data for conducting contaminated site assessments and quantifying estimates of human health risk associated with background levels of potentially hazardous constituents in soils.

225 (CONF-940406–16) **Waste management regulatory compliance issues related to D&D activities at Oak Ridge National Laboratory (ORNL).** Hitch, J.P.; Arnold, S.E.; Burwinkle, T.; Daugherty, D. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on decontamination and decommissioning; Knoxville, TN (United States); 27-29 Apr 1994. Order Number DE94017872. Source: OSTI; NTIS; INIS; GPO Dep.

The waste management activities at ORNL related to the decontamination and decommissioning (D&D) of radioactively contaminated buildings are divided into four categories: Operational facilities, inactive or surplus facilities, future facilities planning, and D&D activities. This paper only discusses regulatory issues related to inactive or surplus facilities. Additionally, rather than attempting to address all resulting waste streams and related regulations, this paper highlights only a few of the ORNL waste streams that present key regulatory issues.

226 (CONF-940571–2) **Negotiating equity for management of DOE wastes.** Carnes, S.A. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Networld + interop '94 engineer's conference; Las Vegas, NV (United States); 2-6 May 1994. Order Number DE94017755. Source: OSTI; NTIS; INIS; GPO Dep.

One important factor frustrating optimal management of Department of Energy (DOE)-complex wastes is the inability to use licensed and permitted facilities systematically. Achieving the goal of optimal use of DOE's waste management facilities is politically problematic for two reasons. First, no locale wants to bear a disproportionate burden from DOE wastes. Second, the burden imposed by additional wastes transported from one site to another is difficult to characterize. To develop a viable framework for equitably distributing these burdens while achieving efficient use of all DOE waste management facilities, several implementation and equity issues must be addressed and resolved. This paper discusses stakeholder and equity issues and proposes a framework for joint research and action that could facilitate equity negotiations among stakeholder and move toward a more optimal use of DOE's waste management capabilities.

227 (CONF-9411138–1) **Comparison of methods for developing contaminant-particle size distributions for suspended sediment.** Moore, T.D. (Univ. of Tennessee, Knoxville, TN (United States)); Burgoa, B.B.; Fontaine, T.A. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 30. American Water Resources Association (AWRA) annual conference on water quality; Chicago, IL (United States); 6-10 Nov 1994. Order Number DE95001349. Source: OSTI; NTIS; INIS; GPO Dep.

Relationships between contaminant concentration and particle size distribution are required for modeling the transport of contaminated sediment. Standard methods, including the pipette and bottom withdrawal techniques, are unsatisfactory because of the lack of homogeneous separations of each size fraction, which results in uncertainty in the contaminant-particle size relation. In addition, the size fractions produced with these techniques do not contain enough mass for accurate contaminant analyses. To avoid these problems, an alternative method using a settling column and withdrawal times based on Stokes Law has been developed. Tests have been conducted using sediment samples contaminated with Cs-137 from a waste area at Oak Ridge National Laboratory. The samples were separated into sand, coarse and fine silt, and clay-sized particles. The results for particle size distribution and associated contaminant concentrations were evaluated for the settling column, pipette, and bottom withdrawal methods. The settling column method provides homogeneous size fractions, larger aliquots of sediment for contaminant analysis, and is quicker in some cases and less complicated to perform than the other two methods.

228 (DOE/AL/62350–43-Rev.1) **Baseline risk assessment of ground water contamination at the Monument Valley Uranium Mill Tailings Site, Cane Valley, Arizona: Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018466. Source: OSTI; NTIS; INIS; GPO Dep.

This baseline risk assessment evaluates potential impact to public health or the environment from ground water contamination at the former uranium mill processing site in Cane Valley near Monument Valley, Arizona. The US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project has relocated and stabilized this site's tailings and other contaminated material in a disposal cell at Mexican Hat, Utah. The second phase of the UMTRA Project is to evaluate ground water contamination. This risk assessment is the first document specific to this site for the Ground Water Project that evaluates potential health and environmental risks. It will help determine the approach required to address contaminated ground water at the site.

229 (DOE/CAO–941046) **Performance-based waste acceptance criteria preliminary baseline assumptions.** USDOE Carlsbad Area Office, NM (United States). 24 Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002262. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE's) strategy for the management of transuranic (TRU) and TRU mixed wastes has focused on the development of the Waste Isolation Pilot Plant (WIPP). The WIPP repository is designated to receive DOE defense wastes that meet the established criteria for acceptance. As a national strategy [DOE, 1993], DOE does not intend to treat candidate wastes unless treatment or processing are necessary to meet the safety, health, and regulatory criteria for transport and disposal at WIPP. The WIPP WAC has evolved over the past 10 years to include criteria and requirements in support of the Waste Characterization program and other related compliance programs. In aggregate, the final health, safety and regulatory criteria for the waste will be documented in the Disposal WAC. This document serves two purposes. First, it familiarizes regulators and stakeholders with the concept of performance based waste acceptance criteria as an augmentation within a final Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria. Second, the document preliminarily identifies certain waste characteristics that appear important to the performance assessment process for WIPP; therefore, these could become component characteristics in the Performance Based Waste Acceptance Criteria (PBWAC). Identification of the final PBWAC will be accomplished through iterative runs of the System Prioritization Method (SPM). These iterations will serve to more clearly isolate and identify those waste characteristics that directly and predominately impact on the performance assessment.

230 (DOE/EA–0918) **Treatment of M-area mixed wastes at the Savannah River Site.** USDOE Savannah River Operations Office, Aiken, SC (United States). Jun 1994. 56p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001760. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy has prepared this environmental assessment, DOE/EA-0918, to assess the potential environmental impacts of the treatment of mixed wastes currently stored in the M-Area at the Savannah River Site, near Aiken, South Carolina. DOE is proposing to treat and stabilize approximately 700,000 gallons of mixed waste currently stored in the Interim Treatment/Storage Facility (IT/SF) and Mixed Waste Storage Shed (MWSS). This waste material is proposed to be stabilized using a vitrification process and temporarily stored until final disposal is available by the year 2005. This document has been prepared to assess the potential environmental impacts attributable to the treatment and stabilization of M-area mixed wastes, the closure of the interim storage area, and storage of the vitrified waste until disposal in onsite RCRA vaults. Based on the analyses in the environmental assessment, the Department of Energy has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, the preparation of an environmental impact statement is not required, and the Department of Energy is issuing this finding of no significant impact.

231 (DOE/EA–0989) **Environmental assessment for the transportation and disposal of Savannah River Site generated municipal solid waste at an off-site disposal facility.** USDOE Savannah River Operations Office, Aiken, SC (United States). Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002677. Source: OSTI; NTIS; GPO Dep.

This Environmental Assessment (EA) has been prepared by the US DOE to assess the potential environmental impacts associated with a more cost-effective means to collect, remove, and dispose of the municipal solid waste generated by activities at the Savannah River Site (SRS) near Aiken, South Carolina. SRS personnel currently collect all site generated municipal solid waste in various types of containers. The waste is transported to the on-site Interim Sanitary Landfill. DOE proposes to curtail operation of the Interim Sanitary Landfill and award a subcontract for the removal of all permitted nonhazardous, nonradiological municipal solid wastes. These wastes would be transported to a permitted municipal solid waste disposal facility.

232 (DOE/EA–0995) **Final environmental assessment and Finding-of-No-Significant-Impact - drum storage facility for interim storage of materials generated by environmental restoration operations.** USDOE Rocky Flats Office, Golden, CO (United States). Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001761. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has prepared an Environmental Assessment (EA), DOE/EA-0995, for the construction and operation of a drum storage facility at Rocky Flats Environmental Technology Site, Golden, Colorado. The proposal for construction of the facility was generated in response to current and anticipated future needs for interim storage of waste materials generated by environmental restoration operations. A public meeting was held on July 20, 1994, at which the scope and analyses of the EA were presented. The scope of the EA included evaluation of alternative methods of storage, including no action. A comment period from July 5, 1994 through August 4, 1994, was provided to the public and the State of Colorado to submit written comment on the EA. No written comments were received regarding this proposed action, therefore no comment response is included in the Final EA. Based on the analyses in the EA, DOE has determined that the proposed action would not significantly affect the quality of the human environment within the meaning of the National Environmental Policy Act of 1969 (NEPA). Therefore, preparation of an Environmental Impact Statement is not required and the Department is issuing this Finding of No Significant Impact.

233 (DOE/EH–23-0002(a)) **CERCLA site assessment workbook, Volume 1.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. Aug 1994. 164p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002646. Source: OSTI; NTIS; INIS; GPO Dep.

This workbook provides instructions for planning, implementing, and reporting site assessments under CERCLA, commonly referred

to as Superfund. Site assessment consists of two information-gathering steps: the remedial preliminary assessment (PA) and the site inspection (SI). The information obtained is then used to estimate, or score, a site's relative risk to public health and the environment. The score is derived via the hazard ranking system (HRS). Although the workbook and its exercises can be adapted to group study, it is designed primarily for use by an individual.

234 (DOE/ID–10054(93)) **Radioactive waste management information for 1993 and record-to-date.** Taylor, K.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). Jul 1994. 478p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94052). Order Number DE95002007. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents detailed data, bar graphs, and pie charts on volume, radioactivity, isotopic identity, origin, and decay status of radioactive waste for the calendar year 1993. It also summarizes the radioactive waste data records compiled from 1952 to present for the Idaho National Engineering Laboratory (INEL). The data presented are from the INEL Radioactive Waste Management Information System.

235 (DOE/ID–10454) **FY-94 buried waste integrated demonstration program report.** Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94063). Order Number DE95002024. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) supports the applied research, development, demonstration, and evaluation of a multitude of advanced technologies. These technologies are being integrated to form a comprehensive remediation system for the effective and efficient remediation of buried waste. These efforts are identified and coordinated in support of the U.S. Department of Energy (DOE), Environmental Restoration and Waste Management (ER/WM) needs and objectives. This document summarizes previous demonstrations and describes the FY-94 BWID technology development and demonstration activities. Sponsored by the DOE Office of Technology Development (OTD), BWID works with universities and private industry to develop these technologies, which are being transferred to the private sector for use nationally and internationally. A public participation policy has been established to provide stakeholders with timely and accurate information and meaningful opportunities for involvement in the technology development and demonstration process.

236 (DOE/LLW–103-Rev.1) **Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94060). Order Number DE95001911. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a history of commercial low-level radioactive waste disposal in the United States, with emphasis on the history of six commercially operated low-level radioactive waste disposal facilities. The report includes a brief description of important steps that have been taken during the last decade to ensure the safe disposal of low-level radioactive waste in the 1990s and beyond. These steps include the issuance of comprehensive State and Federal regulations governing the disposal of low-level radioactive waste, and the enactment of Federal laws making States responsible for the disposal of such waste generated within their borders.

237 (DOE/LLW–139) **A process for establishing a financial assurance plan for LLW disposal facilities.** Smith, P. (EG and G Idaho, Inc., Idaho Falls, ID (United States). National Low-Level Waste Management Program). EG and G Idaho, Inc., Idaho Falls, ID (United States). National Low-Level Waste Management Program; Rogers and Associates Engineering Corp., Salt Lake City, UT (United States). Apr 1993. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–92024). Order Number DE95001927. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a process by which an effective financial assurance program can be developed for new low-level radioactive waste (LLW) disposal facilities. The report identifies examples of activities that might cause financial losses and the types of losses they might create, discusses mechanisms that could be used to quantify and ensure against the various types of potential losses identified and describes a decision process to formulate a financial assurance program that takes into account the characteristics of both the potential losses and available mechanisms. A sample application of the concepts described in the report is provided.

238 (DOE/LLW–157-Rev.1) **Performance assessment task team progress report.** Wood, D.E. (and others); Curl, R.U.; Armstrong, D.R.; Cook, J.R.; Dolenc, M.R.; Kocher, D.C.; Owens, K.W.; Regnier, E.P.; Roles, G.W.; Seitz, R.R. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1994. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002045. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Headquarters EM-35, established a Performance Assessment Task Team (referred to as the Team) to integrate the activities of the sites that are preparing performance assessments (PAs) for disposal of new low-level waste, as required by Chapter III of DOE Order 5820.2A, "Low-Level Waste Management". The intent of the Team is to achieve a degree of consistency among these PAs as the analyses proceed at the disposal sites. The Team's purpose is to recommend policy and guidance to the DOE on issues that impact the PAs, including release scenarios and parameters, so that the approaches are as consistent as possible across the DOE complex. The Team has identified issues requiring attention and developed discussion papers for those issues. Some issues have been completed, and the recommendations are provided in this document. Other issues are still being discussed, and the status summaries are provided in this document. A major initiative was to establish a subteam to develop a set of test scenarios and parameters for benchmarking codes in use at the various sites. The activities of the Team are reported here through December 1993.

239 (DOE/LLW–188) **Benchmarking of computer codes and approaches for modeling exposure scenarios.** Seitz, R.R. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Rittmann, P.D.; Wood, M.I.; Cook, J.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94062). Order Number DE95001978. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy Headquarters established a performance assessment task team (PATT) to integrate the activities of DOE sites that are preparing performance assessments for the disposal of newly generated low-level waste. The PATT chartered a subteam with the task of comparing computer codes and exposure scenarios used for dose calculations in performance assessments. This report documents the efforts of the subteam. Computer codes considered in the comparison include GENII, PATHRAE-EPA, MICROSHIELD, and ISOSHLD. Calculations were also conducted using spreadsheets to provide a comparison at the most fundamental level. Calculations and modeling approaches are compared for unit radionuclide concentrations in water and soil for the ingestion, inhalation, and external dose pathways. Over 30 tables comparing inputs and results are provided.

240 (DOE/MWIP–30) **Proposed waste form performance criteria and testing methods for low-level mixed waste.** Franz, E.M. (Brookhaven National Lab., Upton, NY (United States)); Fuhrmann, M.; Bowerman, B.; Bates, S.; Peters, R. Brookhaven National Lab., Upton, NY (United States). Aug 1994. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL–52436). Order Number DE95003025. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes proposed waste form performance criteria and testing method that could be used as guidance in judging viability of a waste form as a physico-chemical barrier to releases of radionuclides and RCRA regulated hazardous components. It is assumed that release of contaminants by leaching is the single most important property by which the effectiveness of a waste form is judged. A two-tier regimen is proposed. The first tier includes a

leach test required by the Environmental Protection Agency and a leach test designed to determine the net forward leach rate for a variety of materials. The second tier of tests are to determine if a set of stresses (i.e., radiation, freeze-thaw, wet-dry cycling) on the waste form adversely impact its ability to retain contaminants and remain physically intact. It is recommended that the first tier tests be performed first to determine acceptability. Only on passing the given specifications for the leach tests should other tests be performed. In the absence of site-specific performance assessments (PA), two generic modeling exercises are described which were used to calculate proposed acceptable leach rates.

241 (DOE/NV/11432–123-Vol.1) **US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1.** Black, S.C.; Glines, W.M.; Townsend, Y.E. (eds.). Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Sep 1994. 317p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95003021. Source: OSTI; NTIS; INIS; GPO Dep.

Monitoring and surveillance on and around the Nevada Test Site (NTS) by DOE contractors and NTS user organizations during 1993 indicated that operations on the NTS were conducted in compliance with applicable federal and DOE guidelines, i.e., the dose the maximally exposed offsite individual could have received was less than 0.04 percent of the 10 mrem per year guide for air exposure. No nuclear tests were conducted due to the moratorium. All discharges of radioactive liquids remained onsite in containment ponds, and there was no indication of potential migration of radioactivity to the offsite area through groundwater. Surveillance around the NTS indicated that airborne radioactivity from diffusion, evaporation of effluents, or resuspension was not detectable offsite, and no measurable net exposure to members of the offsite population was detected through the offsite dosimetry program. Using the CAP88-PC model and NTS radionuclide emissions data, the calculated effective dose equivalent to the maximally exposed individual offsite would have been 0.004 mrem. Any person receiving this dose would also have received 97 mrem from natural background radiation. There were no nonradiological releases to the offsite area. Hazardous wastes were shipped offsite to approved disposal facilities. Compliance with the various regulations stemming from the National Environmental Policy Act is being achieved and, where mandated, permits for air and water discharges and waste management have been obtained from the appropriate agencies. Support facilities at off-NTS locations compiled with the requirements of air quality permits and state or local wastewater discharge and hazardous waste permits.

242 (DOE/OR–01-1161/V1-D2/A1) **Addendum to the remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 ponds, boneyard/burnyard, oil landfarm, sanitary landfill I, and the burial grounds, including oil retention ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. main text.** Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Aug 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (Y/ER–105/V1-D2/A1). Order Number DE95002055. Source: OSTI; NTIS; INIS; GPO Dep.

The BCV OU 1 location poses two problems that Data Quality Objectives will address: (1) whether the wastes and soil contamination pose a risk to human health or the environment now or in the future and (2) if the wastes and contamination do pose a risk, what feasible alternatives exist for reducing the risk to acceptable levels?

243 (DOE/OR–01-1311-D1) **Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory.** Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Knoxville, TN (United States). Oct 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–270-D1). Order Number DE95001772. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a Design/Installation and Structural Integrity Assessment for a replacement tank system for portions of the Bethel Valley Low Level Waste (LLW) System, located at the Oak Ridge Reservation, Oak Ridge, Tennessee. This issue of the assessment covers the design aspects of the replacement tank system, and certifies that the design has sufficient structural integrity and is acceptable for the storing or treating of hazardous and/or radioactive substances. The present issue identifies specific activities that must be completed during the fabrication, installation, and testing of the replacement tank system in order to provide assurance that the final installation complies with governing requirements. Portions of the LLW system are several decades old, or older, and do not comply with current environmental protection regulations. Several subsystems of the LLW system have been designated to receive a state-of-the-art replacement and refurbishment. One such subsystem serves Building 2026, the High Radiation Level Analytical Laboratory. This assessment focuses on the scope of work for the Building 2026 replacement LLW Collection and Transfer System, including the provision of a new Monitoring and Control Station (Building 2099) to receive, store, and treat (adjust pH) low level radioactive waste.

244 (DOE/OR–01-1312-D1) **Design/installation and Structural integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory.** Oak Ridge National Lab., TN (United States); Gilbert/Commonwealth, Inc., Oak Ridge, TN (United States). Oct 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–273-D1). Order Number DE95002298. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a Design/Installation and Structural Integrity Assessment for a new tank system for portions of the Bethel Valley Low Level Waste (LLW) System, located at the Oak Ridge Reservation, Oak Ridge, Tennessee. This issue of the assessment covers the design aspects of the new tank system, and certifies that the design has sufficient structural integrity and is acceptable for the storing or treating of hazardous and/or radioactive substances. This document will be reissued at a future data and will then include the assessment of the installation of the new tank system. The present issue identifies specific activities that must be completed during the fabrication, installation, and testing of the new tank system in order to provide assurance that the final installation complies with governing requirements. These requirements are based on meeting the intent of 40 CFR264 Subpart J - Tank Systems, as set forth in Appendix F to the Federal Facility Agreement, Docket No. 89-04-FF, covering the Oak Ridge Reservation. The assessment presented in this document is responsive to the Environmental Restoration Agreement for the Oak Ridge Reservation. The format utilized on preparation of the document follows the format presented in Appendix F, Low Level Radioactive Waste Tank Systems, appended to the Agreement.

245 (DOE/OR–01-1313-D1) **Design/installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste collection and transfer system upgrade for Building 3092 (central off-gas scrubber facility) at Oak Ridge National Laboratory.** Gilbert/Commonwealth, Inc., Reading, PA (United States). Oct 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–274-D1). Order Number DE95002302. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes and assesses planned modifications to be made to the Building 3092 Central Off-Gas Scrubber Facility of the Oak Ridge National Laboratory, Oak Ridge, Tennessee. The modifications are made in response to the requirements of 40CFR264 Subpart J, relating to environmental protection requirements for buried tank systems. The modifications include the provision of a new scrubber recirculation tank in a new, below ground, lined concrete vault, replacing an existing recirculation sump that does not provide double containment. A new buried, double contained pipeline is provided to permit discharge of spent scrubber recirculation fluid to the Central Waste Collection Header. The new vault, tank, and discharge line are provided with leak detection and provisions to remove accumulated liquid. Ne scrubber recirculation pumps, piping, and accessories are also provided.

This assessment concludes that the planned modifications comply with applicable requirements of 40CFR264 Subpart J, as set forth in Appendix F to the Federal Facility Agreement, Docket No. 89-04-FF, covering the Oak Ridge Reservation. A formal design certification statement is included herein on Page 53, a certification covering the installation shall be executed prior to placing the modified facility into service.

246 (DOE/OR–01-1314-D1) **Risk evaluation of embedded, single-walled liquid low-level waste piping at Oak Ridge National Laboratory: ESD Publication 4315.** Oak Ridge National Lab., TN (United States). Oct 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–253). Order Number DE95002297. Source: OSTI; NTIS; INIS; GPO Dep.

Four categories of liquid low-level radioactive waste (LLLW) systems are defined in the Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR). Categories A and B are new and fully compliant existing systems, respectively: Category C is singly contained and must be removed from service, and Category D is inactive. The FFA requires that secondary containment and leak detection be provided for all Category A and B piping in the LLLW System at Oak Ridge National Laboratory (ORNL); however, as noted in the D2 revision of the secondary containment design demonstration report (DOE 1994), some sections of single-walled embedded piping in Category B underground vaults at three ORNL facilities do not meet this requirement. A risk evaluation was performed in order compare the potential radiation dose to a member of the public that could result from a postulated leak in the single-walled pipes with projected radiation exposure to the workers who would modify the piping to meet FFA requirements. The risk to human health from replacing segments of embedded, single-walled piping in the LLW system is higher than the risk of leaving the piping as it is.

247 (DOE/RL–94-130) **1993 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site.** Kirkendall, J.R.; Engel, J.A. Westinghouse Hanford Co., Richland, WA (United States); Kaiser Engineers Hanford Co., Richland, WA (United States); Hanford Environmental Health Foundation, Richland, WA (United States). 24 Oct 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002967. Source: OSTI; NTIS; INIS; GPO Dep.

More important than waste generation numbers, the pollution prevention and waste minimization successes achieved at Hanford in 1993 have reduced waste and improved operations at the Site. Just a few of these projects are: A small research nuclear reactor, unused and destined for disposal as low level radioactive waste, was provided to a Texas University for their nuclear research program, avoiding 25 cubic meters of waste and saving $116,000. By changing the slope on a asphalt lot in front of a waste storage pad, run-off rainwater was prevented from becoming mixed low level waste water, preventing 40 cubic meters of waste and saving $750,000. Through more efficient electrostatic paint spraying equipment and a solvent recovery system, a paint shop reduced hazardous waste by 3,500 kilograms, saving $90,800. During the demolition of a large decommissioned building, more than 90% of the building's material was recycled by crushing the concrete for use on-Site and selling the steel to an off-Site recycler, avoiding a total of 12,600 metric tons of waste and saving $450,000. Additionally, several site-wide programs have avoided large quantities of waste, including the following: Through expansion of the paper and office waste recycling program which includes paper, cardboard, newspaper, and phone books, 516 metric tons of sanitary waste was reduced, saving $68,000. With the continued success of the excess chemicals program, which finds on-Site and off-Site customers for excess chemical materials, hazardous waste was reduced by 765,000 liters of liquid chemicals and 50 metric tons of solid chemicals, saving over $700,000 in disposal costs.

248 (DOE/RW/00134–T14) **Yucca Mountain Site Characterization Project: Technical Data Catalog (quarterly supplement), June 30, 1994.** TRW, Inc., Fairfax, VA (United States). 30 Jun 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-91RW00134. Order Number DE95002190. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE/NRC Site-Specific Procedural Agreement for Geologic Repository Site Investigation and Characterization Program requires the DOE to develop and maintain a catalog of data which will be updated and provided to the NRC at least quarterly. This catalog is to include a description of the data; the date, place, and method of acquisition; and where it may be examined. The Yucca Mountain Site Characterization Project (YMP) Technical Data Catalog is published and distributed in accordance with the requirements of the Site-Specific Agreement. The YMP Technical Data Catalog is a report based on reference information contained in the YMP Automated Technical Data Tracking System (ATDT). The reference information is provided by Participants for data acquired or developed in support of the YMP. The Technical Data Catalog is updated quarterly and published in the month following the end of each quarter. A complete revision to the catalog is published at the end of each fiscal year. Supplements to the end-of-year edition are published each quarter. These supplements provide information related to new data items not included in previous quarterly updates and data items affected by changes to previously published reference information. The Technical Data Catalog, dated September 30, 1993, should be retained as the baseline document for the supplements until the end-of-year revision is published and distributed in October 1994.

249 (DOE/RW–0450) **Site characterization progress report: Yucca Mountain, Nevada, October 1, 1993–March 31, 1994.** USDOE Office of Civilian Radioactive Waste Management, Washington, DC (United States). Oct 1994. 323p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge); INIS.

This report is the tenth in a series issued at intervals of approximately six months during site characterization of Yucca Mountain as a possible site for a geologic repository for the permanent disposal of spent nuclear fuel and high-level radioactive waste. Also included in this report are descriptions of activities such as public outreach and international programs that are not formally part of the site characterization process. Information on these activities is provided to report on all aspects of the Yucca Mountain studies. The Executive Summary is intended to provide a summary of major decisions, activities, accomplishments, and issues of interest during the reporting period. Chapter 1, Introduction, provides background information to assist the reader in understanding the current status of the program. Chapter 2 provides specific detailed discussions of activities conducted during the current reporting period and has two major divisions. Section 2.1, Preparatory Activities, provides information on select preparatory activities necessary to conduct site characterization and design activities. Sections 2.2 through 2.8 provide specific details on studies and activities conducted during the reporting period and follow the original structure of the Department's 1988 Site Characterization Plan. Chapter 3 contains the current summary schedule, while Chapter 4 provides a description of the program outreach, including activities during the reporting period, in both the international program and public outreach. Chapter 5 presents an epilogue of significant events that occurred after the end of the reporting period.

250 (DOE/WIPP–94-1020) **WIPP facility representative program plan.** USDOE Albuquerque Operations Office, NM (United States). Waste Isolation Pilot Plant Project Office. 15 Jul 1994. 34p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002832. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the Department of Energy (DOE), Carlsbad Area Office (CAO) facility representative (FR) program at the Waste Isolation Pilot Plant (WIPP). It provides the following information: (1) FR and support organization authorities and responsibilities; (2) FR program requirements; and (3) FR training and qualification requirements.

251 (DOE/WIPP–94-2018) **Environmental Protection Implementation plan for the Waste Isolation Pilot Plant, November 9, 1994, to November 9, 1995.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1994]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC04-86AL31950. Order Number DE95002831. Source: OSTI; NTIS; INIS; GPO Dep.

This Environmental Protection Implementation Plan (EPIP) has been prepared to meet federal, state, and local requirements by delineating how the Carlsbad Area office (CAO) and the Waste Isolation Pilot Plant (WIPP) Site Branch (WSB) intends to implement the provisions of DOE Order 5400.1. Its purpose is to list environmental protection goals and objectives for the WIPP; identify strategies, manpower allocations, and timetables for attaining these goals and objectives; describe the WIPP organizational structure; discuss the development of procedures; and assign responsibilities for compliance with federal, state, and local environmental laws and regulations. This EPIP covers the periods from November 9, 1994 through November 9, 1995.

252 (DOE/WIPP–94-2027) **1994 Panel 1 Utilization Plan.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1994]. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95002833. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is intended to receive, handle, and permanently dispose of transuranic (TRU) waste. To fulfill this mission, the U.S. Department of Energy (DOE) constructed a full-scale facility to demonstrate both technical and operational principles of the permanent isolation of TRU waste. The WIPP consists of surface and underground facilities. Panel 1 is situated in the underground facility horizon which is located approximately 2,150 feet below the surface in the predominantly halite Salado Formation. The Panel 1 Utilization Plan provides a strategy for the optimum use of Panel 1 which is consistent with the priorities established by the DOE to accomplish the WIPP mission. These priorities, which include maintaining personnel safety, conducting performance assessment, and continued operational enhancements, are the guiding premise for the decisions on the planned usage of the WIPP underground facility. The continuation of ongoing investigations along with the planned testing and training to be carried out in Panel 1 will enhance the current knowledge and understanding of the operational and geotechnical aspects of the panel configuration. This enhancement will ultimately lead to safer, more efficient, and more cost-effective methods of operation. Excavation of the waste storage area began in May 1986 with the mining of entries to Panel 1. The original design for the waste storage rooms at the WIPP provided a limited period of time during which to mine the openings and to emplace waste. Each panel, consisting of seven storage rooms, was scheduled to be mined and filled in less than 5 years. Panel 1 was developed to receive waste for a demonstration phase that was scheduled to start in October 1988. The demonstration phase was deferred, and the experimental test program was modified to use contact-handled (CH) transuranic waste in bin-scale tests, planned for Room 1, Panel 1.

253 (DPST–86-314) **Mercury in shallow Savannah River Plant soil.** Carlton, W.H.; Price, V.; Cook, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1988. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002683. Source: OSTI; NTIS; GPO Dep.

Soil concentrations of adsorbed mercury at 999 sites at the Savannah River Plant (SRP) were determined by Microseeps Limited of Indianola, PA. The sites were in and around the 643-C Burial Ground, at the Savannah River Swamp adjacent to TNX Area, and at a background area. The Burial Ground was chosen as a test site because of a history of disposal of radioactive mercury there prior to 1968. Extremely low traces of mercury have been detected in the water table beneath the Burial Ground. Although the mercury concentrations at the majority of these sites are at background levels, several areas appear to be anomalously high. In particular, an area of large magnitude anomaly was found in the northwest part of the Burial Ground. Three other single point anomalies and several other areas of more subtle but consistently high values were also found. Several sites with anomalous mercury levels were found in an area of the Savannah River flood plain adjacent to TNX Area.

254 (DPW–55-15-12) **Minutes of Technical Division Steering Committee Meeting December 13, 1955, Savannah River Laboratory.** Evans, L.C. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 16 Dec 1955. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–849). Order Number DE95002382. Source: OSTI; NTIS; GPO Dep.

Approvals for various process studies are listed. Safety agreements and related information is given. Technical division financial status is reported. And the analytical chemistry and separations programs at the Savannah River Laboratory are updated. Lastly, the study status for technical division studies are listed.

255 (EGG-M–94237) **A comparison of real-time radiography results and visual characterization results with emphasis on WIPP WAC and TRAMPAC compliance issues.** Hailey, S.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-940216–6: Nondestructive assay and nondestructive examination waste chracterization conference, Pocatello, ID (United States), 14-16 Feb 1994). Order Number DE95001902. Source: OSTI; NTIS; INIS; GPO Dep.

Visual characterization provides a means of confirming the real-time radiography (RTR) certification process and process knowledge. RTR and visual characterization have been conducted on thirty-three drums containing transuranic (TRU) waste in support of the Waste Isolation Pilot Plant (WIPP) Experimental Test Program (WETP) at the Idaho National Engineering Laboratory. Argonne National Laboratory - West (ANL-W) detected a small can of liquid in one of these drums during the visual examination, resulting in a WIPP Waste Acceptance Criteria (WIPP-WAC) miscertification. The remaining thirty-two drums were certified correctly by the RTR system at the Stored Waste Examination Pilot Plant (SWEPP) for WIPP-WAC and TRUPACT-II Authorized Methods for Payload Control (TRAMPAC) requirements. TRAMPAC contains restrictions on the weights of specific materials allowed in the waste, based on the shipping category. Items on the restricted list for a given shipping category are allowed in quantities less than 1 percent of the weight of the waste. RTR can estimate the weights of certain broad categories in homogeneous waste forms, however, the capability to estimate weights at the 1 percent level is not presently realistic. Process knowledge forms the basis of conformance to these weight requirements. Visual characterization suggests process knowledge is not completely adequate at this level.

256 (EGG-M–94273) **Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data.** Liekhus, K.J. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Vaughn, M.E.; Jensen, B.A.; Connolly, M.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-9409178–9: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95002030. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of transuranic waste destined for the Waste Isolation Pilot Plant currently requires detailed characterization of the volatile organic compound (VOC) concentration in the void volume headspaces (drum headspace, the large polymer bag headspace, and the innermost layers of confinement headspace) of the waste drums. A test program is underway at the Idaho National Engineering Laboratory (INEL) to determine if the drum headspace VOC concentration is representative of the concentration in the entire drum void space and demonstrate that the VOC concentration in the innermost layer of confinement can be estimated using a model incorporating diffusion and permeation transport principles and limited waste drum sampling data. A comparison of model predictions of VOC concentration in the innermost layer of confinement with actual measurement from transuranic waste drums demonstrate that this method may be useful in characterizing VOC concentration in a vented waste drum.

257 (EGG-NRE–11451) **SWEPP Gamma-Ray Spectrometer System software design description.** Femec, D.A.; Killian, E.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 391p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC07-76ID01570. Order Number DE95002035. Source: OSTI; NTIS; INIS; GPO Dep.

To assist in the characterization of the radiological contents of contract-handled waste containers at the Stored Waste Examination Pilot Plant (SWEPP), the SWEPP Gamma-Ray Spectrometer (SGRS) System has been developed by the Radiation Measurements and Development Unit of the Idaho National Engineering Laboratory. The SGRS system software controls turntable and detector system activities. In addition to determining the concentrations of gamma-ray-emitting radionuclides, this software also calculates attenuation-corrected isotopic mass ratios of-specific interest. This document describes the software design for the data acquisition and analysis software associated with the SGRS system.

258 (EGG-NRE–11452) **SWEPP gamma-ray spectrometer system software user's guide.** Femec, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002005. Source: OSTI; NTIS; INIS; GPO Dep.

The SWEPP Gamma-Ray Spectrometer (SGRS) System has been developed by the Radiation Measurement and Development Unit of the Idaho National Engineering Laboratory to assist in the characterization of the radiological contents of contact-handled waste containers at the Stored Waste Examination Pilot Plant (SWEPP). In addition to determining the concentrations of gamma-ray-emitting radionuclides, the software also calculates attenuation-corrected isotopic mass ratios of specific interest, and provides controls for SGRS hardware as required. This document serves as a user's guide for the data acquisition and analysis software associated with the SGRS system.

259 (EGG-WM–11250) **A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory.** Martian, P.; Magnuson, S.O. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002050. Source: OSTI; NTIS; INIS; GPO Dep.

Soil moisture monitoring data in the surficial sediments at the Subsurface Disposal Area (SDA) at the Idaho National Engineering Laboratory were used to calibrate two numerical infiltration models. The calibration was performed with the ultimate goal of providing a reliable estimate of hydraulic properties and infiltration amounts to be used in other modeling efforts. Two neutron probe access tubes and a tensiometer nest were monitored from 1986 to 1990 and again during 1993. The field measurements of moisture content and matrix potential inside the SDA were used as calibration data for the two locations. The two locations showed vastly different behavior, which was well captured in the models. The average root mean square error between simulated and measured moisture contents over the simulation period was 0.03 and 0.06 for the two locations. The hydraulic parameters resulting from the calibration compared favorably with laboratory and field scale estimates. The simulation results also provided the opportunity to partially explain infiltration and redistribution processes occurring at the SDA. The underlying fractured basalt appears to behave similar to a capillary barrier. This behavior inhibits moisture movement into the underlying basalts until moisture contents in the overlying silts approach saturation. As a result, a large proportion of recharge occurring at the SDA may be due to spring snowmelt, when the surficial sediments become nearly saturated. The results also indicated that a unit gradient boundary condition (free drainage due to gravity) at the bottom of the silts is not appropriate because of the very low relative hydraulic conductivity of the basalts. Finally, the amount of water moving into the SDA subsurface from spring snowmelt appears larger than cumulative snowfall, indicating that snow drifting due to local topography as well as current snow management practices may have a substantial influence on local infiltration.

260 (EGG-WM–11342) **Project report for the commercial disposal of mixed low-level waste debris.** Andrews, G.; Balls, V.; Shea, T.; Thiesen, T. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1994. 450p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001905. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the basis for the commercial disposal of Idaho National Engineering Laboratory (INEL) mixed low-level waste (MLLW) debris and the associated activities. Mixed waste is radioactive waste plus hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). The critical factors for this project were DOE 5820.2A exemption, contracting mechanism, NEPA documentation, sampling and analysis, time limitation and transportation of waste. This report also will provide a guide or a starting place for future use of Envirocare of Utah or other private sector disposal/treatment facilities, and the lessons learned during this project.

261 (EGG-WM–11479) **Characterization of void volume VOC concentration in vented TRU waste drums - an interim report.** Liekhus, K.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001921. Source: OSTI; NTIS; INIS; GPO Dep.

A test program is underway at the Idaho National Engineering Laboratory to determine if the concentration of volatile organic compounds (VOCs) in the drum headspace is representative of the VOC concentration in the entire drum void space and to demonstrate that the VOC concentration in the void space of each layer of confinement can be estimated using a model incorporating diffusion and permeation transport principles and limited waste drum sampling data. An experimental test plan was developed requiring gas sampling of 66 transuranic (TRU) waste drums. This interim report summarizes the experimental measurements and model predictions of VOC concentration in the innermost layer of confinement from waste drums sampled and analyzed in FY 1994.

262 (EGG-WTD–10640) **Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory.** Shaw, P. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Anderson, B.; Davis, D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1993. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002048. Source: OSTI; NTIS; INIS; GPO Dep.

INEL has radiologically contaminated nitrate salt and soil waste stored above and below ground in Pad A and the Acid Pit at the Radioactive Waste Management Complex. Pad A contain uranium and transuranic contaminated potassium and sodium nitrate salts generated from dewatered waste solutions at the Rocky Flats Plant. The Acid Pit was used to dispose of liquids containing waste mineral acids, uranium, nitrate, chlorinated solvents, and some mercury. Ex situ vitrification is a high temperature destruction of nitrates and organics and immobilizes hazardous and radioactive metals. Laboratory scale melting of actual radionuclides containing INEL Pad A nitrate salts and Acid Pit soils was performed. The salt/soil/additive ratios were varied to determine the range of glass compositions (resulted from melting different wastes); maximize mass and volume reduction, durability, and immobilization of hazardous and radioactive metals; and minimize viscosity and offgas generation for wastes prevalent at INEL and other DOE sites. Some mixtures were spiked with additional hazardous and radioactive metals. Representative glasses were leach tested and showed none. Samples spiked with transuranic showed low nuclide leaching. Wasteforms were two to three times bulk densities of the salt and soil. Thermally co-processing soils and salts is an effective remediation method for destroying nitrate salts while stabilizing the radiological and hazardous metals they contain. The measured durability of these low-level waste glasses approached those of high-level waste glasses. Lab scale vitrification of actual INEL contaminated salts and soils was performed at General Atomics Laboratory as part of the INEL Waste Technology Development and Environmental Restoration within the Buried Waste Integrated Demonstration Program.

263 (EGG-WTD–10651) **INEL Operable Unit 7-13 containment and stabilization configuration option.** Raivo, B.D.; Richardson, J.G.; Nickelson, D.F. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1993. 33p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001926. Source: OSTI; NTIS; INIS; GPO Dep.

A containment and stabilization configuration option has been developed for the Idaho National Engineering Laboratory's Subsurface Disposal Area Operable Unit 7-13, the transuranic (TRU)-contaminated waste pits and trenches. The configuration option is presented as an end-to-end system block diagram. Functional subelements are separately discussed, and technical background information, assumptions, input, high-level subelement requirements, and output are presented for each option.

264 (EGG-WTD–10981-Vol.1) **Baseline tests for arc melter vitrification of INEL buried wastes: Volume 1: Facility description and summary data report.** Oden, L.L.; O'Connor, W.K.; Turner, P.C.; Soelberg, N.R.; Anderson, G.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 19 Nov 1993. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002027. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents field results and raw data from the Buried Waste Integrated Demonstration (BWID) Arc Melter Vitrification Project Phase 1 baseline test series conducted by the Idaho National Engineering Laboratory (INEL) in cooperation with the U.S. Bureau of Mines (USBM). The baseline test series was conducted using the electric arc melter facility at the USBM Albany Research Center in Albany, Oregon. Five different surrogate waste feed mixtures were tested that simulated thermally-oxidized, buried, TRU-contaminated, mixed wastes and soils present at the INEL. The USBM Arc Furnace Integrated Waste Processing Test Facility includes a continuous feed system, the arc melting furnace, an offgas control system, and utilities. The melter is a sealed, 3-phase alternating current (ac) furnace approximately 2 m high and 1.3 m wide. The furnace has a capacity of 1 metric ton of steel and can process as much as 1,500 lb/h of soil-type waste materials. The surrogate feed materials included five mixtures designed to simulate incinerated TRU-contaminated buried waste materials mixed with INEL soil. Process samples, melter system operations data and offgas composition data were obtained during the baseline tests to evaluate the melter performance and meet test objectives. Samples and data gathered during this program included (a) automatically and manually logged melter systems operations data, (b) process samples of slag, metal and fume solids, and (c) offgas composition, temperature, velocity, flowrate, moisture content, particulate loading and metals content. This report consists of 2 volumes: Volume I summarizes the baseline test operations. It includes an executive summary, system and facility description, review of the surrogate waste mixtures, and a description of the baseline test activities, measurements, and sample collection. Volume II contains the raw test data and sample analyses from samples collected during the baseline tests.

265 (EGG-WTD–10981-Vol.2) **Baseline tests for arc melter vitrification of INEL buried wastes: Volume II: Baseline test data appendices.** Oden, L.L.; O'Conner, W.K.; Turner, P.C.; Soelberg, N.R.; Anderson, G.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 19 Nov 1993. 488p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002028. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents field results and raw data from the Buried Waste Integrated Demonstration (BWID) Arc Melter Vitrification Project Phase 1 baseline test series conducted by the Idaho National Engineering Laboratory (INEL) in cooperation with the U.S. Bureau of Mines (USBM). The baseline test series was conducted using the electric arc melter facility at the USBM Albany Research Center in Albany, Oregon. Five different surrogate waste feed mixtures were tested that simulated thermally-oxidized, buried, TRU-contaminated, mixed wastes and soils present at the INEL. The USBM Arc Furnace Integrated Waste Processing Test Facility includes a continuous feed system, the arc melting furnace, an offgas control system, and utilities. The melter is a sealed, 3-phase alternating current (ac) furnace approximately 2 m high and 1.3 m wide. The furnace has a capacity of 1 metric ton of steel and can process as much as 1,500 lb/h of soil-type waste materials. The surrogate feed materials included five mixtures designed to simulate incinerated TRU-contaminated buried waste materials mixed with INEL soil. Process samples, melter system operations data and offgas composition data were obtained during the baseline tests to evaluate the melter performance and meet test objectives. Samples and data gathered during this program included (a) automatically and manually logged melter systems operations data, (b) process samples of slag, metal and fume solids, and (c) offgas composition, temperature, velocity, flowrate, moisture content, particulate loading and metals content. This report consists of 2 volumes: Volume I summarizes the baseline test operations. It includes an executive summary, system and facility description, review of the surrogate waste mixtures, and a description of the baseline test activities, measurements, and sample collection. Volume II contains the raw test data and sample analyses from samples collected during the baseline tests.

266 (EGG-WTD–11136) **Buried waste integrated demonstration Fiscal Year 1993 close-out report.** Owens, K.J.; Hyde, R.A. Idaho National Engineering Lab., Idaho Falls, ID (United States). Apr 1994. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001916. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) supports the applied research, development, demonstration, and evaluation of a multitude of advanced technologies. These technologies are being integrated to form a comprehensive remediation system for the effective and efficient remediation of buried waste. These efforts are identified and coordinated in support of the U.S. Department of Energy Environmental Restoration and Waste Management needs and objectives. BWID works with universities and private industry to develop these technologies, which are being transferred to the private sector for use nationally and internationally. A public participation policy has been established to provide stakeholders with timely and accurate information and meaningful opportunities for involvement in the technology development and demonstration process. To accomplish this mission cf identifying technological solutions for remediation deficiencies, the Office of Technology Development initiated BWID at the Idaho National Engineering Laboratory. This report summarizes the activities of the BWID program during FY-93.

267 (EGG-WTD–11137) **Evaluation of pretreatment processes for supercritical water oxidation.** Barnes, C.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1994. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002047. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates processes to chemically treat US Department of Energy wastes to remove organic halogens, phosphorus, and sulfur. Chemical equilibrium calculations, process simulations, and responses from developers and licensors form the basis for comparisons. Gas-phase catalytic hydrogenation processes, strong base and base catalyzed processes, high pressure hydrolysis, and other emerging or commercial dehalogenation processes (both liquid and mixed phase) were considered. Cost estimates for full-scale processes and demonstration testing are given. Based on the evaluation, testing of a hydrogenation process and a strong base process are recommended.

268 (EGG-WTD–11138) **Arc melter demonstration baseline test results.** Soelberg, N.R.; Chambers, A.G.; Anderson, G.L.; Oden, L.L.; O'Connor, W.K.; Turner, P.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 321p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001977. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the test results and evaluation for the Phase 1 (baseline) arc melter vitrification test series conducted for the Buried Waste Integrated Demonstration program (BWID). Phase 1 tests were conducted on surrogate mixtures of as-incinerated wastes and soil. Some buried wastes, soils, and stored wastes at the INEL and other DOE sites, are contaminated with transuranic (TRU) radionuclides and hazardous organics and metals. The high temperature environment in an electric arc furnace

may be used to process these wastes to produce materials suitable for final disposal. An electric arc furnace system can treat heterogeneous wastes and contaminated soils by (a) dissolving and retaining TRU elements and selected toxic metals as oxides in the slag phase, (b) destroying organic materials by dissociation, pyrolyzation, and combustion, and (c) capturing separated volatilized metals in the offgas system for further treatment. Structural metals in the waste may be melted and tapped separately for recycle or disposal, or these metals may be oxidized and dissolved into the slag. The molten slag, after cooling, will provide a glass/ceramic final waste form that is homogeneous, highly nonleachable, and extremely durable. These features make this waste form suitable for immobilization of TRU radionuclides and toxic metals for geologic timeframes. Further, the volume of contaminated wastes and soils will be substantially reduced in the process.

269 (EGG-WTD–11185) **Test plan for the remote conveyance and innovative end effector demonstration.** Rice, P. (EG&G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab.); Smith, A.M.; Peterson, R. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001390. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan describes the demonstration of innovative equipment and processes specifically designed to be superior to currently employed technology for buried waste retrieval. The dumping of dry soil into a funnel/dumpster arrangement has been found to be the primary mechanism for dust generation during the retrieval of buried transuranic waste. The primary goal of the innovative end effector is to reduce dust generation and the potential spread of airborne contaminants during the dumping operation. In addition, regardless of the excavation technique, exhumed waste will have to be conveyed away from the retrieval area to a packaging area or directly to a treatment facility. The remote conveyance system is aimed at developing a remotely controlled vehicle to convey retrieved waste that will operate on variable terrain and remove workers from the hazardous zone. To demonstrate the remote conveyance system and the innovative end effector, the Buried Waste Integrated Demonstration (BWID) Program has subcontracted with RAHCO International to provide equipment and services to perform a demonstration of the technologies. The demonstration will be performed in two phases. In Phase I, the subcontractor will perform a full scale demonstration to assess the ability of the innovative end effector to control dust generation and the potential spread of contamination during dumping operations. Phase II includes performing a retrieval/conveyance demonstration. This demonstration will excavate, dump, and convey simulated waste to demonstrate the functionality of the system (e.g., maneuverability, retrieval rates, and system integration). Phase II of the demonstration will include all elements of the remote conveyance and end effector system. This test plan will describe the demonstration objectives, data quality objectives, equipment operation, and methods for collecting data during the demonstration.

270 (EGG-WTD–11424) **Test plan for FY-94 digface characterization field experiments.** Josten, N.E.; Roybal, L.G. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002008. Source: OSTI; NTIS; INIS; GPO Dep.

The digface characterization concept has been under development at the Idaho National Engineering Laboratory (INEL) since fiscal year (FY) 1992 through the support of the Buried Waste Integrated Demonstration Program. A digface characterization system conducts continuous subsurface characterization simultaneously with retrieval of hazardous and radioactive waste from buried waste sites. The system deploys multiple sensors at the retrieval operation digface and collects data that provide a basis for detecting, locating, and classifying buried materials and hazardous conditions before they are disturbed by the retrieval equipment. This test plan describes ongoing efforts to test the digface characterization concept at the INEL's Cold Test Pit using a simplified prototype deployment apparatus and off-the-shelf sensors. FY-94 field experiments will explore problems in object detection and classification. Detection and classification of objects are fundamental to three of the four primary functions of digface characterization during overburden removal. This test plan establishes procedures for collecting and validating the digface characterization data sets. Analysis of these data will focus on testing and further developing analysis methods for object detection and classification during overburden removal.

271 (EPD-SGS–94-307) **Uranium geochemistry in soil and groundwater at the F and H seepage basins.** Serkiz, S.M.; Johnson, W.H. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002688. Source: OSTI; NTIS; INIS; GPO Dep.

For 33 years, low activity liquid wastes from the chemical separation areas at the U.S. Department of Energy's Savannah River Site were disposed of in unlined seepage basins. Soil and associated pore water samples of widely varying groundwater chemistries and contaminant concentrations were collected from the region downgradient of these basins using cone penetrometer technology. Analysis of samples using inductively coupled plasma - mass spectrometry has allowed the investigation of uranium partitioning between the aqueous phase and soil surfaces at this site. The distribution of uranium was examined with respect to the solution and soil chemistry (e.g., pH, redox potential, cation and contaminant concentration) and aqueous-phase chemical speciation modeling. The uranium soil source term at the F- and H-Area Seepage Basins (FHSB) is much smaller than has been used in previous modeling efforts. This should result in a much shorter remediation time and a greater effectiveness of a pump-and-treat design than previously predicted. Distribution coefficients at the (FHSB) were found to vary between 1.2 to 34,000 1 kg^{-1} for uranium. Differences in sorption of these elements can be explained primarily by changes in aqueous pH and the associated change in soil surface charge. Sorption models were fit directly to sorption isotherms from field samples. All models underestimated the fraction of uranium bound at low aqueous uranium concentrations. Linear models overestimated bound uranium at locations where the aqueous concentration was greater than 500 ppb. Mechanistic models provided a much better estimate of the bound uranium concentrations, especially at high aqueous concentrations. Since a large fraction of the uranium at the site is associated with the low-pH portion of the plume, consideration should be given to pumping water from the lowest pH portions of the plume in the F-Area.

272 (IAEA-TECDOC–759, pp. 17-19) **Spent nuclear fuel in the Czech Republic.** Fajman, V. (State Office for Nuclear Safety (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9303314–: Technical committee meeting on away-from-reactor storage concepts and their implementation, Vienna (Austria), 15-18 Mar 1993). In *Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993.* 151p. Order Number DE95606401. Source: OSTI; NTIS (US Sales Only); INIS.

A brief survey of the problems concerning the back-end of the fuel cycle in the Czech Republic is presented. There are four PWR reactors in operation and two PWR reactors under construction as well as several research or training reactors in the Czech Republic. The original concept of spent fuel management was based on re-export of the spent fuel to the former USSR. After stopping the transports to Russia and to the interim storage at Jaslovske Bohunice (Slovak Republic), the Czech Power Board decided to re-rach the at-reactor pools and to build an interim storage at Dukovany with a capacity of 600 t HM. It is supposed that the spent fuel assemblies will be stored in CASTOR casks. A final solution concerning the fuel cycle in the Czech Republic has not been adopted yet. The capacity of the at-reactor pools together with the capacity of the planned interim storage at Dukovany will solve the situation approximately until the year 2005. (author).

273 (INIS-JP–018, pp. 1149-1155) **Characterization of the back-end wastes in view of their transportation.** Malesys, P. (Transnucleaire, 75 - Paris (France)). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama

(Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The paper describes some cases TRANSNUCLEAIRE had to face concerning high level, transuranic and irradiating wastes and the way they have been solved in order to provide the most reliable and flexible envelope characterization of the contents. (J.P.N.).

274 (INIS-JP–018, pp. 1163-1170) **Operational and safety aspects of vitrified waste casks.** Kirchner, B. (Transnucleaire, 75 - Paris (France)). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

For the time being two technical solutions have been developed for the interim storage: (1) one is based on forced air cooled pits set out in a concrete structure, as presently provided close to the Vitrification Facilities on reprocessing sites; (2) the other one is based on transportable storage casks standing vertically onto a storage pad, following principles similar to those already experienced with spent fuel storage casks. Considering these two solutions for interim storage, TRANSNUCLEAIRE has developed two main types of transportable casks for vitrified HAW; one is a routine transport cask; the other one is a transportable storage cask. Both are covered by the generic name TN28V and have already been described in previous papers. This paper deals with the safety and operation aspects of the casks under both transport and storage conditions. (J.P.N.).

275 (INIS-JP–018, pp. 1617-1620) **The acceptance, before transport, of the waste radioactive packages on the disposal facilities of ANDRA.** Lecoq, P. (Agence Nationale pour la Gestion des Dechets Radioactifs, 75 - Paris (France)). 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Short communication. RADIOACTIVE WASTES/packaging; PACKAGING/transport regulations; FRANCE; PACKAGING; UNDERGROUND DISPOSAL; RADIOACTIVE WASTE FACILITIES; MARITIME TRANSPORT

276 (INIS-mf–14320) **Treatment of low-level radioactive cesium-137 and technetium-99 liquid wastes by inorganic ion-exchangers.** Ya-Anant, N. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology. 1992. 130p. (In Thai). Order Number DE95604064. Source: OSTI; NTIS (US Sales Only); INIS.

This study has been directed towards the testing and evaluation of selected inorganic ion-exchangers that are inexpensive and suitable for the conditioning and disposal of radioactive wastes. The experiments were based on sorption characteristics of inorganic ion-exchange materials and their ability to retain radionuclides. The sorption efficiency of cesium-137 and technetium-99 on exchangers was tested under various conditions including the effect of pH, equilibrium time, temperature and concentration for bentonite, kaolinite, sand and sandy soil, which are classified as natural inorganic exchangers. Titanium dioxide, zeolite, antimony pentioxide and hydrated antimony pentoxide (HAP) were used as synthetic inorganic exchangers. This report also includes a basic study of the cementation process along with the measurement of several important waste from properties such as physical stability, compressive strength and leachability. The percentage sorption efficiency of cesium-137 was found to be 99, 98, 88, 87, 86 and 85 respectively for zeolite, kaolinite, antimony pentoxide, sandy soil, sand and HAP, at 25-50^{0}C, pH range 3-9 and 10-20 minutes contact time. The sorption of technetium-99 on antimony pentoxide was 80-90, at 25^0 C, pH range 1-9 and 5 days contact time. The physical stability tests indicated that all specimens had good homogeneity. Percentages of weight-loss after 28 day cure times at ambient room temperature were in the range of 7-15, 2-6, 6-9, 3-10 and 4-5 for bentonite, kaolinite, zeolite, titanium dioxide and sand respectively. The compressive strength of conditioned waste form consisting of various simulated waste compositions are reported. For the purpose of this study, an arbitrary compressive strength value of 150 kgm/cm^2 was established. The proper percentage composition of cemented wastes were 19, 24, 25, 45 and 54 for bentonite, kaolinite, zeolite, titanium dioxide and sand respectively. (Abstract Truncated)

277 (INIS-mf–14347) **Principles and criteria for creation of a concept for national radwaste repository.** Milanov, M.; Strezov, A.; Kojuharov, D. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 7p. IAEA Regional Project for Technical Assistance PEP/9/010. (CONF-9302194–: IAEA experts' meeting on recommendations on management of radioactive wastes from WWER, Sofia (Bulgaria), 23-26 Feb 1993). Order Number DE95604074. Source: OSTI; NTIS (US Sales Only); INIS.

General principles and criteria based on the international experience and requirements as well as on specific Bulgarian conditions are used in the creation of the Concept for Radwaste Repository Construction as a first stage of the Bulgarian nuclear programme. The Concept contains about 70 projects of common or more specific character. The Bulgarian territory is categorized and several prospective areas are selected as a final result of the analysis performed. A model for development of a National System for Radwaste Management is considered. The formation of a working group appointed by governmental authorities as a solution of the existing highly complex situation connected with the treatment and storage of radwaste in the country is proposed. 1 fig., 14 refs. (author).

278 (INIS-mf–14348) **Research procedure and criteria for analysis and choice of variants for construction of national radioactive waste repository.** Vachev, B. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 12p. IAEA Regional Project for Technical Assistance PEP/9/010. (CONF-9302194–: IAEA experts' meeting on recommendations on management of radioactive wastes from WWER, Sofia (Bulgaria), 23-26 Feb 1993). Order Number DE95604075. Source: OSTI; NTIS (US Sales Only); INIS.

General principles, overlying objectives and basic radioactive waste management strategy future priorities are considered. The research procedure is based on system approach and analysis, decision making theory, basic objectives and principles of the national repository construction. Main criteria and some basic notions (like radioactive wastes environment and radioactive wastes barriers - input and output) are introduced. Six environment elements are identified: surroundings and natural environment, economic, scientific and technical-technological, socio-psychological, legal and institutional-political. Flow charts of the hierarchical structure of research procedure, decision making levels and direct and back feeds are presented and a scenario analysis is proposed as one of the tools for reflection of uncertainty. The hierarchical structure of the high level waste repository construction scenarios and variants tree (8 levels) is defined. The methodology and methods of analysis, screening and choice of variants is considered. A 7-group system of criteria and constrains for analysis, screening and choice of variants is formulated. One implementation of the proposed methodology and procedure is the technological choice for radioactive waste conditioning and solving of a preliminary site selection problem. 4 figs., 25 refs. (author).

279 (INIS-mf–14349) **Site selection procedure for high level radioactive waste disposal in Bulgaria.** Evstatiev, D.; Vachev, B. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 7p. IAEA Regional Project for Technical Assistance PEP/9/010. (CONF-9302194–: IAEA experts' meeting on recommendations on management of radioactive wastes from WWER, Sofia (Bulgaria), 23-26 Feb 1993). Order Number DE95604076. Source: OSTI; NTIS (US Sales Only); INIS.

A combined site selection approach is implemented. Bulgaria's territory has been classified in three categories, presented on a

1:500000 scale map. The number of suitable sites has been reduced to 20 using the method of successive screening. The formulated site selection problem is a typical discrete multi-criteria decision making problem under uncertainty. A 5-level procedure using Expert Choice Rating and relative models is created. It is a part of a common procedure for evaluation and choice of variants for high level radwaste disposal construction. On this basis 7-8 more preferable sites are demonstrated. A new knowledge and information about the relative importance of the criteria and their subsets, about the level of criteria uncertainty and the reliability are gained. It is very useful for planning and managing of the next final stages of the site selection procedure. 7 figs., 8 refs., 4 suppls. (author).

280 (INIS-mf–14350) **A review of the technology and experience of spent nuclear fuel storage. Alternatives for the problem of spent fuel in Bulgaria.** Vapirev, E. Sofia Univ. (Bulgaria). Katedra po Atomna Fizika. 1993. 5p. IAEA Regional Project for Technical Assistance PEP/9/010. (CONF-9302194–: IAEA experts' meeting on recommendations on management of radioactive wastes from WWER, Sofia (Bulgaria), 23-26 Feb 1993). Order Number DE95604065. Source: OSTI; NTIS (US Sales Only); INIS.

Three different possibilities for spent fuel (SF) management in different countries are reviewed: (1) final disposal of the fuel without reprocessing, (2) processing and (3) wet or dry storage waiting for better/cheaper reprocessing or final disposal technologies. The problems of dry storage as cladding failures and destruction of the crystal structure of the fuel grains leading to the release of fission fragments are discussed. The basic requirements for dry storage facilities as well as the basic types of facilities licensed for long term storage of UO_2 are reviewed. The main economic and technological arguments which should be kept in mind when discussing the alternatives for SF storage in Bulgaria are outlined. The acceptable solution for Bulgaria is of the type of so called deferred decision. An appendix with an overview on the experience of 10 countries is applied. 20 refs., 1 suppl. (author).

281 (INIS-mf–14351) **Methodology for evaluation of the reliability and safety of interim and final repositories for radioactive waste.** Mateeva, M.; Boyadjiev, A. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 19p. IAEA Regional Project for Technical Assistance PEP/9/010. (CONF-9302194–: IAEA experts' meeting on recommendations on management of radioactive wastes from WWER, Sofia (Bulgaria), 23-26 Feb 1993). Order Number DE95604077. Source: OSTI; NTIS (US Sales Only); INIS.

The methodology is based on a set of macro models, mathematical methods and computer codes describing events and processes of radionuclide migration from the repository to the biosphere and evaluating the exposure doses to the population from the area in case of an emergency scenario. The basic macromodels are: Near Field; Intermediate Field; Far Field and Biosphere. The development and effects of corrosion processes, considering complex corrosion as well as local corrosion, are emphasized. The basic modules in the set of computer codes used are: FEMWATER (Sandia NL, USA) modelling radionuclide migration from the repository; PAGAN, which includes the codes DISPERSE and SURFACE, modelling radionuclide migration by surface waters; and GEN II PRESTO, which evaluates the direct dispersion of radioactivity into the atmosphere by the Gaussian model. On the basis of methodology proposed a qualitative assessment of the safety and reliability of the radwaste repository can be made. 5 figs., 45 refs. (author).

282 (INIS-mf–14352) **Natural sorbents as barriers against migration of radionuclides from radioactive waste repositories.** Stefanova, I.; Gradev, G.D. Bylgarska Akademiya na Naukite, Sofia (Bulgaria). Inst. za Yadrena Izsledvaniya i Yadrena Energetika. 1993. 21p. IAEA Regional Project for Technical Assistance PEP/9/010. (CONF-9302194–: IAEA experts' meeting on recommendations on management of radioactive wastes from WWER, Sofia (Bulgaria), 23-26 Feb 1993). Order Number DE95604078. Source: OSTI; NTIS (US Sales Only); INIS.

The sorption properties of Bulgarian inorganic sorbents - clinoptilolite, vermiculite, bentonite, glauconite, celadonite and loess, which can be used as buffer, backfill and sealing materials in radwaste repository are studied. Experimental data about sorption and desorption capacities, radiation and thermal stability of sorbents from different Bulgarian deposits are reported and compared. Clinoptilolite from Beli Plast and its sodium variety from Kostino and Moryantsi is recommended as a barrier against radionuclide migration from radwaste repository due to their high sorption capacity of ^{137}Ce, ^{90}Sr and ^{60}Co. The high selectivity of vermiculite for polyvalent ions (^{144}Ce, ^{59}Fe and ^{90}Sr) gives grounds to include the sorption on vermiculite as a second step in the ion exchange technology for low level laundry waste decontamination. Bentonite is studied as a proposed buffer, backfill and sealing material. Its selectivity for cesium is lower compared to those of clinoptilolite. Thus a tailored-made mixture of bentonite and clinoptilolite will act as a barrier against radionuclides in different oxidation state. Glauconite can be successfully used as a barrier against migration of ^{144}Ce, ^{90}Sr, ^{54}Mn and ^{65}Zn. Loess is also included in the study, as the Kozloduy NPP is sited on loess formation and it is a natural potential site for low and intermediate level waste burial. It is concludes that zeolites and clays of Bulgarian deposits can be used effectively against radionuclide migration from radioactive waste repositories. 59 refs., 5 tabs. (author).

283 (INIS-mf–14392, pp. 201-216) **Radioactive waste management.** McKinley, I.G. (Nationale Genossenschaft fuer die Lagerung Radioaktiver Abfaelle (NAGRA), Baden (Switzerland)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The radioactive waste management is one of the most important activities connected with nuclear industry. The main sources of the radioactive wastes has been identified and classified in three groups as high level, intermediate and low level wastes. The management and disposal methods have been described in respect to all class of the wastes. 7 figs, 1 tab.

284 (IPNO-DRE–94-04) **Transmutation of nuclear wastes: A working report to Nupecc.** Schapira, J.P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. 17p. Order Number DE95606777. Source: OSTI; NTIS (US Sales Only); INIS.

An evaluation of present options to handle and store spent fuels from nuclear power plants is presented. Alternative of complementary options should be considered, e.g., transmutation, a method to transform long-lived nuclei into short-lived or less radiotoxic nuclei. Neutron appears as the ideal particle to induce these transmutations, called transmutation or incineration depending on the main route, capture or fission, resp. An overview of and technical options for transmutation are discussed in detail. (R.P.) 45 refs., 4 figs., 2 tabs.

285 (KTM/E-B–181) **Evaluation of the Finnish nuclear waste management programme: Report of the WATRP review team.** Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. May 1994. 43p. Order Number DE95606761. Source: OSTI; NTIS; INIS.

International Atomic Energy Agency Waste Management Assessment and Review Programme; The report is published also in Finnish as report number KTM/E-B–180.

In response to a request from Finland in November 1992, the International Atomic Energy Agency (IAEA) set up a Team of four experts (representatives from Belgium, Canada, Germany and Switzerland) to review the Finnish nuclear waste management programme within the auspices of IAEA's Waste Management programme (WATRP). During the early summer of 1993, the Team reviewed a large amount of documentation supplied by the Finnish industry, government and research organizations. The radioactive waste management programme areas within the Team's terms of reference included: (1) work being done in siting and building a conditional facility for spent nuclear fuel and siting and constructing a co-located repository, (2) the plans and activities for conditioning and disposing of the low and intermediate level waste from Finland's NPPs and (3) the plans for decommissioning Finland's reactors when that becomes necessary. The evaluation work and the recommendations of the Team are detailed in the report.

286 (LA–12792-PR) **In-place testing summary (1992): Progress report.** Martinez, V.A.; Barney, D.; Helland, G.; Kain, C. Los Alamos National Lab., NM (United States). Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001433. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the latest in a series of annual reports regarding the ongoing in-place testing program for high-efficiency filtration and chemical adsorber systems at the Los Alamos National Laboratory. This testing is conducted to maintain regulatory permits and to verify that the performance levels, installation, and function of these filtration systems have not deteriorated since the last operating cycle. Furthermore, the performance data obtained from the testing of high efficiency particulate air-filtered vacuums and negative pressure machines aid in the implementation and continuing activities of the asbestos management program at Los Alamos national Laboratory. In addition, this report provides an overview of the testing procedures used to conduct the in-place tests, a summary of the individual system performance, and any trend that has been observed since the last operating cycle.

287 (LA-SUB–94-159) **Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993.** Lasaga, A.C. (Yale Univ., New Haven, CT (United States). Dept. of Geology and Geophysics); Ganor, J. Los Alamos National Lab., NM (United States); Yale Univ., New Haven, CT (United States). Dept. of Geology and Geophysics. [1994]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001752. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary results are provided on: Synthesis and characterization of analcime and Na-clinoptilolite (Penn State), batch solubility experiments on analcime and clinoptilolite, thermodynamic modelling of solubility data, and kinetic flow-through experiments on analcime and clinoptilolite.

288 (LA-UR–94-2891) **Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures.** Reimus, P.W. (Los Alamos National Lab., NM (United States)); Robinson, B.A.; Nuttall, H.E.; Kale, R. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941075–1: 18. international symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE94018318. Source: OSTI; NTIS; INIS; GPO Dep.

Tracer transport experiments involving colloids that showed little tendency to attach to rock surfaces and a nonsorbing solute (iodide) -were conducted in three different well-characterized natural fractures in tuff. The colloids always arrived earlier in the effluent than the iodide, which we believe is evidence of (1) hydrodynamic chromatography and/or (2) the fact that the colloids experience a smaller effective volume in the fracture because they diffuse too slowly to enter low-velocity regions (dead zones) along the rough fracture walls. The iodide also approached the inlet concentration in the effluent more slowly than the colloids, with the concentration at a given elution volume being greater at higher flow rates. By contrast, the rate of approach of the colloid concentration to the inlet concentration did not vary with flow rate. We attribute this behavior to matrix diffusion of the iodide, with the colloids being too large/nondiffusive to experience this phenomenon. Dispersion of all tracers was greatest in the fracture of widest average aperture and least in the fracture of narrowest aperture, which is consistent with Taylor dispersion theory. The tracer experiments were modeled/interpreted using a three-step approach that involved (1) estimating the aperture distribution in each fracture using surface profiling techniques, (2) predicting the flow field in the fractures using a localized parallel-plate approximation, and (3) predicting tracer transport in the fractures using particle-tracking techniques. Although considered preliminary at this time, the model results were in qualitative agreement with the experiments.

289 (LA-UR–94-3196) **Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring.** Filippone, C.L.; Schofield, T.G. Los Alamos National Lab., NM (United States). Aug 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95000911. Source: OSTI; NTIS; INIS; GPO Dep.

Horizontal and vertical measurements of moisture content were obtained daily using time domain reflectometry (TDR) at four sites in two crushed tuff experimental plots over a period of 287 days. Moisture contents were also measured weekly at the same locations and at two additional locations in the plots using the neutron probe method. Results are assessed to determine the influence of waveguide length and waveguide orientation on TDR moisture content measurements, the degree of spatial variability in measured moisture content in this engineered porous material, and the ability of TDR to resolve vertical moisture content gradients. Recommendations are made for TDR instrumentation of mixed waste landfill monitoring systems.

290 (LA-UR–94-3359) **Reduction of nitrate and nitrite salts under hydrothermal conditions.** Foy, B.R.; Dell'Orco, P.C.; Wilmanns, E.; McInroy, R.; Ely, J.; Robinson, J.M.; Buelow, S.J. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409237–1: 12. international conference on the properties of water and steam, Washington, DC (United States), Sep 1994). Order Number DE95001020. Source: OSTI; NTIS; INIS; GPO Dep.

The feasibility of reducing nitrate/nitrite salts under hydrothermal conditions for the treatment of aqueous mixed wastes stored in the underground tanks at the Department of Energy site at Hanford, Washington was studied. The reduction of nitrate and nitrite salts by reaction with EDTA using a tank waste simulant was examined at temperatures between 623K and 800K and pressures between 0.6 and 1.2 kbar. Continuous flow reactors were used to determine kinetics and products of reactions. All reactions were studied under pressures high enough to produce single phase conditions. The reactions are rapid, go to completion in less than a minute, and produce simple products, such as carbonate, nitrogen, and nitrous oxide gases. The experimental results demonstrate the ability of chemical reactions under hydrothermal conditions to reduce the nitrate and nitrite salts and destroy organic compounds in the waste mixtures.

291 (LA-UR–94-3491) **Base hydrolysis and hydrothermal processing of PBX-9404.** Flesner, R.L.; Spontarelli, T.; Dell'Orco, P.C.; Sanchez, J.A. Los Alamos National Lab., NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409178–10: American Chemical Society meeting on industrial and engineering chemistry, Atlanta, GA (United States), 19-21 Sep 1994). Order Number DE95002720. Source: OSTI; NTIS; INIS; GPO Dep.

Base hydrolysis in combination with hydrothermal processing has been proposed as an environmentally acceptable alternative to open burning/open detonation for degradation and destruction of high explosives. In this report, the authors examine gaseous and aqueous products of base hydrolysis of the HMX-based plastic bonded explosive, PBX-9404. They also examined products from the subsequent hydrothermal treatment of the base hydrolysate. The gases produced from hydrolysis of PBX-9404 are ammonia, nitrous oxide, and nitrogen. Major aqueous products are sodium formate, acetate, nitrate, and nitrite, but not all carbon products have been identified. Hydrothermal processing of base hydrolysate destroyed up to 98% of the organic carbon in solution, and higher destruction efficiencies are possible. Major gas products detected from hydrothermal processing were nitrogen and nitrous oxide.

292 (NUREG–1494) **Staff Technical Position on consideration of fault displacement hazards in geologic repository design.** McConnell, K.I.; Lee, M.P. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Waste Management. Sep 1994. 33p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Nuclear Regulatory Commission regulations for the disposal of spent nuclear fuel and high-level radioactive waste in a geologic repository recognize that fault displacement is a potentially adverse

condition. However, they do not prohibit designing the geologic repository against the effects of such a potentially adverse condition. This Staff Technical Position recognizes the acceptability of designing the geologic repository to take into account the attendant effects (e.g., displacement) of faults of regulatory concern and expresses the staff's views on what is needed from the US Department of Energy if it chooses to locate structures, systems, and components important to safety or important to waste isolation in areas that contain faults of regulatory concern.

293 (ORNL/TM–12441) **Proposed Atomic Energy of Canada Ltd. ^{99}Mo waste calcination process.** Ramey, D.W.; Haas, P.A.; Malkemus, D.W.; McGinnis, C.P.; Meyers, E.S.; Patton, B.D.; Birdwell, J.F.; Jubin, R.T.; Coltharp, K.A. Oak Ridge National Lab., TN (United States). Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002490. Source: OSTI; NTIS; INIS; GPO Dep.

Atomic Energy of Canada Limited (AECL), at its Chalk River Laboratory, generates from 3000 to 5000 L/year of high-level fissile waste solution from the production of ^{99}Mo. In this Mo process, highly enriched uranium (93 wt % ^{235}U, total uranium basis) contained in uranium-aluminum alloy target rods is irradiated to produce the ^{99}Mo product. The targets are removed from the reactor and dissolved in a mercury nitrate-catalyzed reaction with nitric acid. The ^{99}Mo product is then recovered by passing the solution through an alumina (Al^2O^3) column. During discussions with personnel from the Oak Ridge National Laboratory (ORNL) on September 10, 1992, the ORNL-developed technology formerly applied to the solidification of aqueous uranium waste (Consolidated Edison Uranium Solidification Program or CEUSP) was judged potentially applicable to the AECL ^{99}Mo waste. Under a Work-for-Others contract (no. ERD-92-1132), which began May 24, 1993, ORNL was tasked to determine the feasibility of applying the CEUSP (or a similar) calcination process to solidify AECL's ^{99}Mo waste for > 30 years of safe dry storage. This study was to provide sufficient detailed information on the applicability of a CEUSP-type waste solidification process to allow AECL to select the process which best suited its needs. As with the CEUSP process, evaporation of the waste and a simultaneously partial destruction of acid by reaction with formaldehyde followed by in situ waste can thermal denitration waste was chosen as the best means of solidification. Unlike the CEUSP material, the ^{99}Mo waste has a considerable number of problem volatile and semivolatile constituents which must be recovered in the off-gas treatment system. Mercury removal before calcination was seen as the best option.

294 (ORNL/TM–12792) **Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department.** Bartling, M.H.; Bayne, C.K.; Cunningham, G.R. Oak Ridge National Lab., TN (United States). Sep 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002512. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the sampling and analytical procedures needed for the initial characterization of the filter press cake waste from the Process Waste Treatment Plant (PWTP) at the Oak Ridge National Laboratory (ORNL). It is anticipated that revisions to this document will occur as operating experience and sample results suggest appropriate changes be made. Application of this document will be controlled through the ORNL Waste Management and Remedial Action Division. The sampling strategy is designed to ensure that the samples collected present an accurate representation of the waste process stream. Using process knowledge and preliminary radiological activity screens, the filter press cake waste is known to contain radionuclides. Chemical characterization under the premise of this sampling and analysis plan will provide information regarding possible treatments and ultimately, disposal of filter press cake waste at an offsite location. The sampling strategy and analyses requested are based on the K-25 waste acceptance criteria and the Nevada Test Site Defense Waste Acceptance Criteria, Certification, and Transfer Requirements [2, NVO-325, Rev. 1]. The sampling strategy will demonstrate that for the filter press cake waste there is (1) an absence of RCRA and PCBs wastes, (2) an absence of transuranic (TRU) wastes, and (3) a quantifiable amount of radionuclide activity.

295 (ORNL/TM–12825) **Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique.** Gwo, J.P. (Oak Ridge National Lab., TN (United States)); Toran, L.E.; Morris, M.D.; Wilson, G.V. Oak Ridge National Lab., TN (United States). Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002841. Source: OSTI; NTIS; INIS; GPO Dep. Environmental Sciences Division publication number 4325.

Subsurface stormflow, because of its dynamic and nonlinear features, has been a very challenging process in both field experiments and modeling studies. The disposal of wastes in subsurface stormflow and vadose zones at Oak Ridge National Laboratory, however, demands more effort to characterize these flow zones and to study their dynamic flow processes. Field data and modeling studies for these flow zones are relatively scarce, and the effect of engineering designs on the flow processes is poorly understood. On the basis of a risk assessment framework and a conceptual model for the Oak Ridge Reservation area, numerical models of a proposed waste disposal site were built, and a Latin-hypercube simulation technique was used to study the uncertainty of model parameters. Four scenarios, with three engineering designs, were simulated, and the effectiveness of the engineering designs was evaluated. Sensitivity analysis of model parameters suggested that hydraulic conductivity was the most influential parameter. However, local heterogeneities may alter flow patterns and result in complex recharge and discharge patterns. Hydraulic conductivity, therefore, may not be used as the only reference for subsurface flow monitoring and engineering operations. Neither of the two engineering designs, capping and French drains, was found to be effective in hydrologically isolating downslope waste trenches. However, pressure head contours indicated that combinations of both designs may prove more effective than either one alone.

296 **Method for treating materials for solidification.** Jantzen, C.M.; Pickett, J.B.; Martin, H.L. To Dept. of Energy. 1992. Filed date 18 Sep 1992. U.S. Patent Application 7-946,733. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001780. Source: OSTI; NTIS (US Sales Only); GPO Dep.

According to its major aspects and broadly stated, the present invention is a method for treating materials, including hazardous wastes, for solidification in a solid, substantially nonleachable product. Addition of amorphous reactive silica to the material results in enhanced stabilization and retention of hazardous species in either glass or cement. The process includes adjustment of the composition of the waste to take advantage of common glass-forming or cement-forming constituents already present therein. The waste is analyzed to determine its composition, including the concentration of common glass-forming and cement-forming compounds, in order to assess the amount and type of additives needed to obtain an end product with the desired constituents. The waste may be a liquid, a solid, or a sludge, and may contain chemical waste, radioactive waste, mixed chemical and radioactive, heavy metals, or other wastes. The amount of each constituent needed is added to the waste, and the resulting mixture assayed to verify that its combined constituents are within the correct operational range. The mixture is processed to form a solid, stable product.

297 (PNL–8900) **1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan.** Bamberger, J.A.; Liljegren, L.M. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003006. Source: OSTI; NTIS; INIS; GPO Dep.

Million gallon double-shell tanks (DSTs) at Hanford are used to store transuranic, high-level, and low-level wastes. These wastes generally consist of a large volume of salt-laden solution covering a smaller volume of settled sludge primarily containing metal hydroxides. These wastes will be retrieved and processed into immobile waste forms suitable for permanent disposal. The current retrieval concept is to use submerged dual-nozzle pumps to mobilize the settled solids by creating jets of fluid that are directed at the tank solids. The pumps oscillate, creating arcs of high-velocity fluid jets that sweep the floor of the tank. After the solids are mobilized, the pumps will continue to operate at a reduced flow rate

sufficient to maintain the particles in a uniform suspension. The objectives of these 1/12-scale scoping experiments are to determine how Reynolds number, Froude number, and gravitational settling parameter affect the degree of uniformity achieved during jet mixer pump operation in the full-scale double-shell tanks; develop linear models to predict the degree of uniformity achieved by jet mixer pumps operating in the full-scale double-shell tanks; apply linear models to predict the degree of uniformity that will be achieved in tank 241-AZ-101 and determine whether contents of that tank will be uniform to within ± 10% of the mean concentration; and obtain experimental concentration and jet velocity data to compared with the TEMPEST computational and modeling predictions to guide further code development.

298 (PNL–10061) **Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993.** Sula, M.J.; Jette, S.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002582. Source: OSTI; NTIS; INIS; GPO Dep.

Assessments for evaluating compliance with airborne radionuclide emission monitoring requirements in the National Emission Standards for Hazardous Air Pollutants (NESHAPs - U.S. Code of Federal Regulations, Title 40 Part 61, Subparts H and I) were performed for 33 buildings at the U.S. Department of Energy's (DOE) Pacific Northwest Laboratory on the Hanford Site, and for five buildings owned and operated by Battelle, Pacific Northwest Laboratories in Richland, Washington. The assessments were performed using building radionuclide inventory data obtained in 1992 and 1993. Results of the assessments are summarized in Table S.1 for DOE-PNL buildings and in Table S.2 for Battelle-owned buildings. Based on the radionuclide inventory assessments, four DOE-PNL buildings (one with two emission points) require continuous sampling for radionuclides per 40 CFR 61. None of the Battelle-owned buildings require continuous emission sampling.

299 (PNL–10099) **Tank characterization report for Single-Shell Tank B-111.** Remund, K.M.; Tingey, J.M.; Heasler, P.G.; Toth, J.J.; Ryan, F.M.; Hartley, S.A.; Simpson, D.B.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001660. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-B-111 (hereafter referred to as B-111) is a 2,006,300 liter (530,000 gallon) single-shell waste tank located in the 200 East B tank farm at Hanford. Two cores were taken from this tank in 1991 and analysis of the cores was conducted by Battelle's 325-A Laboratory in 1993. Characterization of the waste in this tank is being done to support Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-44-05. Tank B-111 was constructed in 1943 and put into service in 1945; it is the second tank in a cascade system with Tanks B-110 and B-112. During its process history, B-111 received mostly second-decontamination-cycle waste and fission products waste via the cascade from Tank B-110. This tank was retired from service in 1976, and in 1978 the tank was assumed to have leaked 30,300 liters (8,000 gallons). The tank was interim stabilized and interim isolated in 1985. The tank presently contains approximately 893,400 liters (236,000 gallons) of sludge-like waste and approximately 3,800 liters (1,000 gallons) of supernate. Historically, there are no unreviewed safety issues associated with this tank and none were revealed after reviewing the data from the latest core sampling event in 1991. An extensive set of analytical measurements was performed on the core composites. The major constituents (> 0.5 wt%) measured in the waste are water, sodium, nitrate, phosphate, nitrite, bismuth, iron, sulfate and silicon, ordered from largest concentration to the smallest. The concentrations and inventories of these and other constituents are given. Since Tanks B-110 and B-111 have similar process histories, their sampling results were compared. The results of the chemical analyses have been compared to the dangerous waste codes in the Washington Dangerous Waste Regulations (WAC 173-303). This assessment was conducted by comparing tank analyses against dangerous waste characteristics 'D' waste codes; and against state waste codes.

300 (PNL–10101) **Tank characterization report for Single-Shell Tank T-102.** Remund, K.M.; Hartley, S.A.; Toth, J.J.; Tingey, J.M.; Heasler, P.G.; Ryan, F.M.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001659. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-T-102 (hereafter referred to as T-102) is a 530,000 gallon single-shell waste tank located in the 200 West T Tank farm at the Hanford Site. In 1993, two cores were taken from this tank and analysis of the cores was conducted by Battelle's 325-A Laboratory. Characterization of the waste in this tank was conducted to support Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-44-05. Tank T-102 was constructed in 1943 and put into service in 1945; it is the second tank in a cascade system with Tanks T-101 and T-103. During its process history, Tank T-102 received mostly Metal Waste (MW) from the Bismuth Phosphate Process and Coating Waste (CW) from the REDOX Process via the cascade from Tank T-101 and in transfers from Tank C-102. In 1956, the MW was removed from T-102 by pumping and sluicing'. This tank was declared inactive and retired from service in 1976. In 1981, intrusion prevention and stabilization measures were taken to isolate the waste in T-102. The tank presently contains approximately 121,100 liters (32,000 gallons) of liquid and sludge-like waste. Historically, there are no unreviewed safety issues associated with this tank and none were revealed after reviewing the data from the latest core sampling event in 1993. An extensive set of analytical measurements was performed on the core composites. The major constituents (>0.5 wt%) of the waste are water, aluminum, sodium, iron, and nitrate, ordered from the largest concentration to the smallest. The concentrations and inventories of these and other constituents are given. The results of the chemical analyses have been compared to the dangerous waste codes in the Washington Dangerous Waste Regulations (WAC 173-303).

301 (PNL–10107) **Public values related to decisions in the Tank Waste Remediation System Program.** Armacost, L.L. (Pacific Northwest Lab., Richland, WA (United States)); Robershotte, M.; von Winterfeldt, D.; Creighton, J. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002853. Source: OSTI; NTIS; INIS; GPO Dep.

Managers of the Tank Waste Remediation System (TWRS) Program have to make numerous decisions, ranging from the strategic decisions on the fundamental tank cleanup goals to technical decisions on which types of equipment to use in mechanical retrieval of wastes. Furthermore, many of these decisions have to be made repeatedly (e.g., the annual allocation of research and development funds to TWRS activities). These decisions have many potential consequences in terms of risks to workers, risks to the public, environmental impacts, and economic development and cost. Because these consequences affect the values of many parties, the consequences need to be evaluated in terms that are accepted and understood by the interested parties. Therefore, an effort needs to be made to incorporate public concerns and values into the TWRS decision-making process. The purpose of this report is to review and integrate this past work on values and to create a maser list of values in order to create a consistent value framework for the numerous TWRS decisions; efficiently and effectively use public values in the decision-making process by updating this report on a regular basis to ensure that the information represents the public's current views; provide guidance about using values in technical TWRS decisions.

302 (PNL–10127) **Flammable gas safety program: Analytical methods development: FY 1994 progress report.** Campbell, J.A.; Clauss, S.; Grant, K.; Hoopes, V.; Lerner, B.; Lucke, R.; Mong, G.; Rau, J.; Wahl, K.; Steele, R. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001661. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the status of developing analytical methods to account for the organic components in Hanford waste tanks, with particular focus on tanks assigned to the Flammable Gas Watch List. The methods that have been developed are illustrated by their application to samples obtained from Tank 241-SY-101 (Tank 101-SY).

303 (PNL–10128) **Waste Tank Organic Safety Program: Analytical methods development: Progress report, FY 1994.** Campbell, J.A. (and others); Clauss, S.A.; Grant, K.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001658. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of this task are to develop and document extraction and analysis methods for organics in waste tanks, and to extend these methods to the analysis of actual core samples to support the Waste Tank organic Safety Program. This report documents progress at Pacific Northwest Laboratory (a) during FY 1994 on methods development, the analysis of waste from Tank 241-C-103 (Tank C-103) and T-111, and the transfer of documented, developed analytical methods to personnel in the Analytical Chemistry Laboratory (ACL) and 222-S laboratory. This report is intended as an annual report, not a completed work.

304 (PNL–10146) **Dual shell pressure balanced reactor vessel: Final project report.** Robertus, R.J.; Fassbender, A.G. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002845. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Office of Energy Research (OER) has previously provided support for the development of several chemical processes, including supercritical water oxidation, liquefaction, and aqueous hazardous waste destruction, where chemical and phase transformations are conducted at high pressure and temperature. These and many other commercial processes require a pressure vessel capable of operating in a corrosive environment where safety and economy are important requirements. Pacific Northwest Laboratory (PNL) engineers have recently developed and patented (U.S. patent 5,167,930 December 1, 1992) a concept for a novel Dual Shell Pressure Balanced Vessel (DSPBV) which could solve a number of these problems. The technology could be immediately useful in continuing commercialization of an R&D 100 award-winning technology, Sludge-to-oil Reactor System (STORS), originally developed through funding by OER. Innotek Corporation is a small business that would be one logical end-user of the DSPBV reactor technology. Innotek is working with several major U.S. engineering firms to evaluate the potential of this technology in the disposal of wastes from sewage treatment plants. PNL entered into a CRADA with Innotek to build a bench-scale demonstration reactor and test the system to advance the economic feasibility of a variety of high pressure chemical processes. Hydrothermal processing of corrosive substances on a large scale can now be made significantly safer and more economical through use of the DSPBV. Hydrothermal chemical reactions such as wet-air oxidation and supercritical water oxidation occur in a highly corrosive environment inside a pressure vessel. Average corrosion rates from 23 to 80 miles per year have been reported by Rice (1994) and Latanision (1993).

305 (PNL–10147) **Characterization and monitoring of 300 Area Facility liquid waste streams: Status report.** Manke, K.L. (ed.); Riley, R.G.; Ballinger, M.Y.; Damberg, E.G.; Evans, J.C.; Ikenberry, A.S.; Olsen, K.B.; Ozanich, R.M.; Thompson, C.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001484. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of characterizing and monitoring the following sources during a portion of this year: liquid waste streams from Buildings 331, 320, and 3720; treated and untreated Columbia River water; and water at the confluence of the waste streams (that is, end-of-pipe). Characterization and monitoring data were evaluated for samples collected between March 22 and June 21, 1994, and subsequently analyzed for hazardous chemicals, radioactivity, and general parameters. Except for bis(2-ethylhexyl)phthalate, concentrations of chemicals detected and parameters measured at end-of-pipe were below the US Environmental Protection Agency existing and proposed drinking water standards. The source of the chemicals, except bis(2-ethylhexyl)phthalate, is not currently known. The bis(2-ethylhexyl)phthalate is probably an artifact of the plastic tubing used in the early stages of the sampling program. This practice was stopped. Concentrations and clearance times for contaminants at end-of-pipe depended strongly on source concentration at the facility release point, waste stream flow rates, dispersion, and the mechanical action of sumps. When present, the action of sumps had the greatest impact on contaminant clearance times. In the absence of sump activity, dispersion and flow rate were the controlling factors.

306 (PNL–10150) **Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994.** Rai, D.; Felmy, A.R.; Smith, S.C.; Ryan, J.L. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001923. Source: OSTI; NTIS; INIS; GPO Dep.

The solubility of $Cs_2NiFe(CN)_6(c)$ [1] as a function of NaOH and temperature was determined to ascertain whether [1] shows retrograde solubility (i.e., decreasing solubility with increasing temperature), which would have bearing on the possible formation of "hot spots" in the tanks and thus the safety of the ferrocyanide tanks. The results show that the aqueous concentrations of Cs in equilibrium with [1] at 25, 60, 75 and 90 C are similar (within the limits of experimental error), indicating that [1] does not show retrograde solubility. To understand general solubility relationships of $Ni_2Fe(CN)_6(c)$ [2] and to determine the influence on solubility of high electrolyte concentrations (e.g., $NaNO_3$) that are commonly encountered in the ferrocyanide tanks, the solubility of [2] as a function of $CsNO_3$, $NiCl_2$, and $NaNO_3$ was determined. In general, [2] is fairly insoluble and shows slightly increased solubility at high electrolyte concentrations only. For [2] in $NiCl_2$, the aqueous Fe concentrations show first a decrease and then an increase with the increase in $NiCl_2$ concentrations. The increase in Fe concentrations at high Ni concentrations appears to be the result of replacement of Fe by Ni in the [2] structure. For [2] in $CsNO_3$ and at 0.001 M $Na_4Fe(CN)_6$, the Cs is quantitatively removed from solution at low added Cs concentrations and appears to approach the final solid composition of [1]. The solubility of [2] in $NaNO_3$ and at 0.001 M $Na_4Fe(CN)_6$ shows an increase in Ni concentrations to about 0.5 mg/l at $NaNO_3$ concentrations > 1.0 M. These increased Ni concentrations may be the result of substitution of Na for Ni in the solid phase.

307 (PNL–10158) **Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system.** Spane, F.A. Jr.; Vermeul, V.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001922. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory, as part of the Hanford Site Ground-Water Surveillance Project, examines the potential for offsite migration of contamination within the upper basalt confined aquifer system. For the past 40 years, hydrologic testing of the upper basalt confined aquifer has been conducted by a number of Hanford Site programs. Hydraulic property estimates are important for evaluating aquifer flow characteristics (i.e., ground-water flow patterns, flow velocity, transport travel time). Presented are the first comprehensive Hanford Site-wide summary of hydraulic properties for the upper basalt confined aquifer system (i.e., the upper Saddle Mountains Basalt). Available hydrologic test data were reevaluated using recently developed diagnostic test analysis methods. A comparison of calculated transmissivity estimates indicates that, for most test results, a general correspondence within a factor of two between reanalysis and previously reported test values was obtained. For a majority of the tests, previously reported values are greater than reanalysis estimates. This overestimation is attributed to a number of factors, including, in many cases, a misapplication of nonleaky confined aquifer analysis methods in previous analysis

reports to tests that exhibit leaky confined aquifer response behavior. Results of the test analyses indicate a similar range for transmissivity values for the various hydro-geologic units making up the upper basalt confined aquifer. Approximately 90% of the calculated transmissivity values for upper basalt confined aquifer hydrogeologic units occur within the range of 10^0 to 10^2 m^2/d, with 65% of the calculated estimate values occurring between 10^1 to 10^2 m^2d. These summary findings are consistent with the general range of values previously reported for basalt interflow contact zones and sedimentary interbeds within the Saddle Mountains Basalt.

308 (PNL–10172) **Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994).** Ligotke, M.W.; Pool, K.H.; Lerner, B.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002583. Source: OSTI; NTIS; INIS; GPO Dep.

This report is to provide analytical results for use in safety and toxicological evaluations of the vapor space of Hanford single-shell waste storage tanks C-103. Samples were analysed to determine concentrations of ammonia, nitric oxide, nitrogen dioxide, sulfur oxides, and hydrogen cyanide. In addition to the samples, controls were analyzed that included blanks, spiked blanks, and spiked samples. These controls provided information about the suitability of sampling and analytical methods. Also included are the following: information describing the methods and sampling procedures used; results of sample analyses; and Conclusions and recommendations.

309 (PNL–10198) **The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste.** Tingey, J.M.; Bredt, P.R.; Shade, E.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003176. Source: OSTI; NTIS; INIS; GPO Dep.

Of the 177 high-level waste underground storage tanks at the Hanford Site, 25 have been identified as being potentially capable of generating and releasing flammable gas. Tank 241-SY-101 has exhibited periodic releases of gas, and in some cases the gas released has exceeded the lower flammable gas limit. The components of the released gas from Tank 241-SY-101 are hydrogen, nitrous oxide, nitrogen, ammonia, carbon monoxide, and methane. A mitigation strategy that may effectively reduce the retention and release of these gases and the release of flammable gases is dilution coupled with eating of the tank wastes. The purpose of this work was to determine changes in rheological and physical properties caused by heating and dilution of actual 241-SY-101 waste. In May and December 1991, following periodic gas releases, samples of the waste in Tank 241-SY-101 were obtained. Current work quantified the effects of heating coupled with NaOH dilution of a combination of waste samples from Tank 241-SY-101 characteristic of a non-convective layer. The experimental approach and results of this heating and dilution study on Tank 241-SY-101 waste samples are described in Sections 2 and 3, respectively. In Section 3.1, a discussion of the rheological properties of the waste as a function of shearing forces, volume percent dilution, and temperature is presented. In Section 3.2, the physical properties of the waste dilutions are described, including the densities of the slurry, filtered solids, and filtrate; the settling behavior; and the percent filtered solids in the composite sample and each of the composite dilutions. A brief discussion of the results and uncertainties is given is Section 3.3. The conclusions of this investigation are reported in Section 4.

310 (PNL-SA–23850) **Data quality objectives process applied to characterization of Hanford tanks containing ferrocyanide.** Pulsipher, B.A. (Pacific Northwest Lab., Richland, WA (United States)); Anderson, C.M.; Buck, J.W.; Cash, R.J.; Dukelow, G.T.; Meacham, J.E. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815–81: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017460. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1944, underground storage tanks located at the Hanford Site in Richland, Washington, have stored approximately 277,000 m^3 (60 Mgal) of highly radioactive and non-radioactive wastes. Recently, a number of safety issues have arisen concerning these tanks, with regard to worker and public health. The US Department of Energy (DOE) has made the resolution of these safety concerns its number one priority at the Hanford Site. The safety program of the Tank Waste Remediation System (TWRS) was developed to provide an integrated approach to resolution of these waste tank safety issues and safety concerns. The Characterization Program within TWRS is responsible for characterizing the wastes contained in the tanks. To ensure that characterization activities provide data that will be adequate to resolve safety concerns, the Data Quality Objectives (DQO) process is being implemented.

311 (RFP–4834) **Risk perception on management of nuclear high-level and transuranic waste storage.** Dees, L.A. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. 15 Aug 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE94017987. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's program for disposing of nuclear High-Level Waste (HLW) and transuranic (TRU) waste has been impeded by overwhelming political opposition fueled by public perceptions of actual risk. Analysis of these perceptions shows them to be deeply rooted in images of fear and dread that have been present since the discovery of radioactivity. The development and use of nuclear weapons linked these images to reality and the mishandling of radioactive waste from the nations military weapons facilities has contributed toward creating a state of distrust that cannot be erased quickly or easily. In addition, the analysis indicates that even the highly educated technical community is not well informed on the latest technology involved with nuclear HLW and TRU waste disposal. It is not surprising then, that the general public feels uncomfortable with DOE's management plans for with nuclear HLW and TRU waste disposal. Postponing the permanent geologic repository and use of Monitored Retrievable Storage (MRS) would provide the time necessary for difficult social and political issues to be resolved. It would also allow time for the public to become better educated if DOE chooses to become proactive.

312 (RFP–4873) **The ignitability potential of uranium "roaster oxide".** Stakebake, J.L. EG and G Rocky Flats, Inc., Golden, CO (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. (CONF-9409181–9: 19. Department of Energy conference on compatibility, aging and service life, Los Alamos, NM (United States), 28-30 Sep 1994). Order Number DE95001875. Source: OSTI; NTIS; GPO Dep.

The oxidation of uranium to form Uranium 'roaster oxide' was investigated with respect to concerns of unreacted metal remaining in the roaster oxide matrix. It was found that ignition of unreacted uranium chips in the roaster oxide as synthesized is unlikely under normal storage conditions.

313 (RFP–4890) **Saltcrete formulation.** Semones, G.B. (ed.); Connell, J.M.; Jorgensen, S.C. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. 28 Sep 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90RF62349. Order Number DE95001971. Source: OSTI; NTIS; INIS; GPO Dep.

The information gathered since the first report shows that the currently generated waste and most of the waste in inventory has low concentrations of hazardous chemicals and is certifiable for disposable. This is based on preliminary analyses. Sampling and analysis for the purpose of gathering the legally defensible data required for certification and permanent disposal is in progress. The main technical issue is the expansion of the waste form. Some of the cemented waste expands and damages the containers. According to a petrology study, the expansion is caused by the formation of darapskite, a nitrate-sulfate salt. Darapskite occurs when there is high porosity causing microfractures and waste form expansion.

314 (SAND–94-0278) **Test interference calculations for the Yucca Mountain Project ESF thermomechanical experiments: Yucca Mountain Site Characterization Project.** Holland,

J.F. (Technadyne, Albuquerque, NM (United States)); Pott, J. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001856. Source: OSTI; NTIS; INIS; GPO Dep.

The Yucca Mountain Project, managed by the U.S. Department of Energy, is examining the feasibility of siting a repository for high-level nuclear waste at Yucca Mountain on and adjacent to the Nevada Test Site. As part of the site characterization, a series of in situ thermomechanical experiments are planned, which are to be conducted in the Exploratory Studies Facility (ESF). In this report, the results of preliminary analyses of three of the in situ thermomechanical experiments are presented. The major objective of these analyses was to determine the boundaries of the thermally perturbed zones surrounding each of the experiments. The boundaries of the thermal zones needs to be known in order to avoid test interference between the experiments planned for the ESF. A second objective of these analyses was to calculate the displacements and stresses associated with the experiments, in order to advance the planning of the experiments.

315 (SAND–94-0805C) **Thermodynamic modeling of neptunium(V) solubility in concentrated Na-CO_3-HCO_3-Cl-ClO_4-H-OH-H_2O systems.** Novak, C.F. (Sandia National Labs., Albuquerque, NM (United States)); Roberts, K.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941075–2: 18. international symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE95001605. Source: OSTI; NTIS; INIS; GPO Dep.

Safety assessments of nuclear waste repositories often require estimation of actinide solubilities as a function of groundwater composition. Although considerable amount of research has been done on the solubility and speciation of actinides, relatively little has been done to unify these data into a model applicable to concentrate brines. Numerous authors report data on the aqueous chemical properties of Np(V) in $NaClO_4$, Na_2CO_3, and NaCl media, but a consistent thermodynamic model for predicting these properties is not available. To meet this need, a model was developed to describe the solubility of Np(V) in Na-Cl-ClO_4-CO_3 aqueous systems, based on the Pitzer activity coefficient formalism for concentrated electrolytes. Hydrolysis and/or carbonate complexation are the dominant aqueous reactions with neptunyl in these systems. Literature data for neptunyl extraction and solubility, and solubility data that the authors developed, are used to parameterize an integrated model for Np(V) solubility in the Np(V)-Na-CO_3-HCO_3-Cl-ClO_4-H-OH-H_2O system. The resulting model is tested against additional solubility data, and compared with Np(V) solubility experiments in complex synthetic brines.

316 (SAND–94-2106) **Characteristics of special-case wastes potentially destined for disposal at the Nevada Test Site.** Price, L.L. (Science Applications International Corp., Albuquerque, NM (United States)); Duran, F.A. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002590. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) is responsible for disposing of a variety of radioactive and mixed wastes, some of which are considered special-case waste because they do not currently have a clear disposal option. It may be possible to dispose of some of the DOE's special-case waste using greater confinement disposal techniques at the Nevada Test Site (NTS). The DOE asked Sandia National Laboratories to investigate this possibility by performing system configuration analyses. The first step in performing system configuration analyses is to estimate the characteristics of special-case waste that might be destined for disposal at the NTS. The objective of this report is to characterize this special-case waste based upon information available in the literature. No waste was sampled and analyzed specifically for this report. The waste compositions given are not highly detailed, consisting of grains and curies of specific radionuclides per cubic meter. However, such vague waste characterization is adequate for the purposes of the system configuration task. In some previous work done on this subject, Kudera et al. [1990] identified nine categories of special-case radioactive waste and estimated volumes and activities for these categories. It would have been difficult to develop waste compositions based on the categories proposed by Kudera et al. [1990], so we created five groups of waste on which to base the waste compositions. These groups are (1) transuranic waste, (2) fission product waste, (3) activation product waste, (4) mobile/volatile waste, and (5) sealed sources. The radionuclides within a given group share common characteristics (e.g., alpha-emitters, heat generators), and we believe that these groups adequately represent the DOE's special-case waste potentially destined for greater confinement disposal at the NTS.

317 (SAND–94-2380C) **Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants.** Klavetter, E.A. (Sandia National Labs., Albuquerque, NM (United States)); Brown, N.E.; Trudell, D.; Zheng, Z.; Thibaud-Erkey, C.; Gu, D.; Anthony, R.G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940813–29: 208. American Chemical Society national meeting, Washington, DC (United States), 21-26 Aug 1994). Order Number DE95001618. Source: OSTI; NTIS; INIS; GPO Dep.

A new class of inorganic ion exchangers, called crystalline silicotitanates (CSTs), has been prepared at Sandia National Laboratories and Texas A&M University. CSTs have been determined to have high selectivity for the adsorption of Cs and Sr, and several other radionuclides from highly alkaline, high-sodium supernate solutions such as those found at Westinghouse Hanford (WHC). Continuous flow, ion-exchange columns are expected to be used to remove Cs and other radionuclides from the Hanford tank supernate. The proposed application for the CST would be Cs removal from highly alkaline salt solutions in a single pass process with interim storage of the Cs loaded CST until the glass vitrification plant is operational. This paper presents test results which address material requirements relevant for Hanford radwaste processing. This paper also discusses the integrated experimental and modeling approach being developed to establish the performance of the CST materials for the range of solution compositions and processing conditions which are expected to occur. The status on the commercialization of the CST material is also discussed.

318 (SAND–94-2759C) **Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components.** Gundiler, I.H. (New Mexico Bureau of Mines and Mineral Resources, Socorro, NM (United States)); Lutz, J.D.; Wheelis, W.T. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940204–11: 123. annual meeting of the Minerals, Metals and Materials Society, San Francisco, CA (United States), 27 Feb - 3 mar 1994). Order Number DE95002187. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories (SNL) is tasked to support The Department of Energy in the dismantlement and disposal of SNL designed weapon components. These components are sealed in a potting compound, and contain heavy metals, explosive, radioactive, and toxic materials. SNL developed a process to identify and remove the hazardous sub-components utilizing real-time radiography and abrasive water-jet cutting. The components were then crushed, granulated, screened, and separated into an aluminum and a precious-and-base-metals fraction using air-tables. Plastics were further cleaned for disposal as non-hazardous waste. New Mexico Bureau of Mines and Mineral Resources assisted SNL in investigation of size-reduction and separation technologies.

319 (SKB-TR–94-06) **First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones.** Baeckblom, G.; Svemar, C. (eds.). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Jan 1994. 181p. (CONF-9303316–: First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones, Saastaholm (Sweden), 30-31 Mar 1993). Order Number DE95606789. Source: OSTI; NTIS; INIS.

Final disposal of high-level nuclear waste has not yet been carried out in any country today. The concepts under development are all based on geological repositories, i.e., disposal at a sufficient depth below the surface to provide stable mechanical, hydrological and chemical conditions during the period the waste needs to be isolated from man. In the cases where crystalline bedrock is considered the proposed repository depths vary between 300-1000 m. The construction, operation and sealing of a deep geological repository must meet various criteria that in many respects are more detailed and more demanding than usual in underground construction projects today. The work shall be done so that occupational safety is ensured. The work also shall conform to whatever restrictions are necessary for ensuring pre-closure operational safety and post-closure long-term safety. March 1993 SKB arranged a two-day international workshop to discuss design and construction of repositories. Close to 40 participants from eight countries shared experiences regarding passage of major water-conducting fracture zones and other matters. This report summarizes the contributions to the workshop.

320 (UCRL-JC–115352) **Evaluation of thermo-hydrological performance in support of the thermal loading systems study.** Buscheck, T.A. (Lawrence Livermore National Lab., CA (United States). Earth Sciences Dept.); Nitao, J.J.; Saterlie, S.F. Lawrence Livermore National Lab., CA (United States). Jan 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940553–82: International high-level radioactive waste management conference, Las Vegas, NV (United States), 22-26 May 1994). Order Number DE95002404. Source: OSTI; NTIS; INIS; GPO Dep.

Heat generated as a result of emplacing spent nuclear fuel will significantly affect the pre- and post-closure performance of the Mined Geological Disposal System (MGDS) at the potential repository site in Yucca Mountain. Understanding thermo-hydrological behavior under repository thermal loads is essential in (a) planning and conducting the site characterization and testing program, (b) designing the repository and engineered barrier system, and (c) assessing performance. The greatest concern for hydrological performance is source of water that would contact a waste package, accelerate its failure rate, and eventually transport radionuclides to the water table. The primary sources of liquid water are: (1) natural infiltration, (2) condensate generated under boiling conditions, and (3) condensate generated under sub-boiling conditions. Buoyant vapor flow, occurring either on a sub-repository scale or on a mountain scale, any affect the generation of the second and third sources of liquid water. A system of connected fractures facilitates repository-heat-driven gas and liquid flow as well as natural infiltration. With the use of repository-scale and sub-repository-scale models, the authors analyze thermo-hydrological behavior for Areal Mass Loadings (AMLs) of 24.2, 35.9, 55.3, 83.4, and 110.5 MTU/acre for a wide range of bulk permeability. They examine the temporal and spatial extent of the temperature and saturation changes during the first 100,000 yr. They also examine the sensitivity of mountain scale moisture redistribution to a range of AMLs and bulk permeabilities. In addition, they investigate how boiling and buoyant, gas-phase convection influence thermo-hydrological behavior in the vicinity of emplacement drifts containing spent nuclear fuel.

321 (UCRL-JC–116202) **Advanced pyrochemical technologies for minimizing nuclear waste.** Bronson, M.C.; Dodson, K.E.; Riley, D.C. Lawrence Livermore National Lab., CA (United States). 1 Jun 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940602–21: 35. annual meeting of the American Nuclear Society, New Orleans, LA (United States), 11-16 Jun 1994). Order Number DE95002266. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is seeking to reduce the size of the current nuclear weapons complex and consequently minimize operating costs. To meet this DOE objective, the national laboratories have been asked to develop advanced technologies that take uranium and plutonium, from retired weapons and prepare it for new weapons, long-term storage, and/or final disposition. Current pyrochemical processes generate residue salts and ceramic wastes that require aqueous processing to remove and recover the actinides. However, the aqueous treatment of these residues generates an estimated 100 liters of acidic transuranic (TRU) waste per kilogram of plutonium in the residue. Lawrence Livermore National Laboratory (LLNL) is developing pyrochemical techniques to eliminate, minimize, or more efficiently treat these residue streams. This paper will present technologies being developed at LLNL on advanced materials for actinide containment, reactors that minimize residues, and pyrochemical processes that remove actinides from waste salts.

322 (UCRL-JC–116431) **A large block heater test for high level nuclear waste management.** Lin, W. (and others); Wilder, D.G.; Blink, J.A. Lawrence Livermore National Lab., CA (United States). Jul 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941075–3: 18. international symposium on the scientific basis for nuclear waste management, Kyoto (Japan), 23-27 Oct 1994). Order Number DE95002403. Source: OSTI; NTIS; INIS; GPO Dep.

The radioactive decay heat from nuclear waste packages may, depending on the thermal load, create coupled thermal-mechanical-hydrological-chemical (TMHC) processes in the near-field environment of a repository. A group of tests on a large block (LBT) are planned to provide a timely opportunity to test and calibrate some of the TMHC model concepts. The LBT is advantageous for testing and verifying model concepts because the boundary conditions are controlled, and the block can be characterized before and after the experiment. A block of Topopah Spring tuff of about 3 x 3 x 4.5 m will be sawed and isolated at Fran Ridge, Nevada Test Site. Small blocks of the rock adjacent to the large block will be collected for laboratory testing of some individual thermal-mechanical hydrological and chemical processes. A constant load of about 4 MPa will be applied to the top and sides of the large block. The sides will be sealed with moisture and thermal barriers. The large block will be heated by heaters within and guard heaters on the sides so that a dry-out zone and a condensate zone will exist simultaneously. Temperature, moisture content, pore pressure, chemical composition, stress, and displacement will be throughout the block during the heating and cool-down phases. The results from the experiments on small blocks and the tests on the large block will provide a better understanding of some concepts of the coupled TMHC processes. The progress of the project is presented in this paper.

323 (WHC-EP–0460) **Feasibility study for the processing of Hanford Site cesium and strontium isotopic sources in the Hanford Waste Vitrification Plant.** Anantatmula, R.P. (Westinghouse Hanford Co., Richland, WA (United States)); Watrous, R.A.; Nelson, J.L.; Perez, J.M.; Peters, R.D.; Peterson, M.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1991. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001296. Source: OSTI; NTIS; INIS; GPO Dep.

The final environmental impact statement for the disposal of defense-related wastes at the Hanford Site (Final Environmental Impact Statement: Disposal of Hanford Defense High-Level, Transuranic and Tank Wastes [HDW-EIS] [DOE 1987]) states that the preferred alternative for disposal of cesium and strontium wastes at the Hanford Site will be to package and ship these wastes to the commercial high-level waste repository. The Record of Decision for this EIS states that before shipment to a geologic repository, these wastes will be packaged in accordance with repository waste acceptance criteria. However, the high cost per canister for repository disposal and uncertainty about the acceptability of overpacked capsules by the repository suggest that additional alternative means of disposal be considered. Vitrification of the cesium and strontium salts in the Hanford Waste Vitrification Plant (HWVP) has been identified as a possible alternative to overpacking. Subsequently, Westinghouse Hanford Company's (Westinghouse Hanford) Projects Technical Support Office undertook a feasibility study to determine if any significant technical issues preclude the vitrification of the cesium and strontium salts. Based on the information presented in this report, it is considered technically feasible to blend the cesium chloride and strontium fluoride salts with neutralized current acid waste (NCAW) and/or complexant concentrate (CC) waste feedstreams, or to blend the salts with fresh frit and process the waste through the HWVP.

324 (WHC-EP–0467-Rev.1) **Facility effluent monitoring plan for the B plant.** Lesser, J.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002474. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the U.S. Department of Energy in DOE Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438-1. This facility effluent monitoring plant assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements. This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated every three years.

325 (WHC-EP–0786) **Tank Waste Remediation System decisions and risk assessment.** Johnson, M.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002232. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) mission is to store, treat, and immobilize the highly radioactive Hanford Site tank wastes and encapsulated cesium and strontium materials in an environmentally sound, safe, and cost effective manner. Additionally, the TWRS conducts, as part of this mission, resolution of safety issues associated with the wastes within the 177 underground radioactive waste tanks. Systems engineering principles are being applied to determine the functions and establish requirements necessary for accomplishing the TWRS mission (DOE 1994 draft). This systematic evaluation of the TWRS program has identified key decisions that must be executed to establish mission scope, determine requirements, or select a technical solution for accomplishing identified functions and requirements. Key decisions identified through the systematic evaluation of the TWRS mission are presented in this document. Potential alternative solutions to each decision are discussed. After-discussion and evaluation of each decision with effected stakeholder groups, the US Department of Energy (DOE) will select a solution from the identified alternatives for implementation. In order to proceed with the development and execution of the tank waste remediation program, the DOE has adopted a planning basis for several of these decisions, until a formal basis is established. The planning bases adopted by the DOE is continuing to be discussed with stakeholder groups to establish consensus for proceeding with proposed actions. Technical and programmatic risks associated with the planning basis adopted by the DOE are discussed.

326 (WHC-EP–0794) **Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II.** McLaren, J.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001529. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to document the results of a series of analyses conducted to determine the heat loads of the second of two groups of tanks on the Ferrocyanide Watch List. The analyses of the second group of tanks used the fill/transfer history and tank temperature data with a transient solution for the heat load determination. Nominal heat load values were determined, as well as the upper and lower bounds of the heat load. Because the waste level in most of these tanks was low, thermal conductivity estimation could only be made for two tanks. The method used in this report uses computer analysis of the tank and its contents, along with the temperature data obtained from in situ thermocouple trees, to determine the heat load of the tanks and the thermal conductivity of the waste. A computer model of the tank and its contents is used that also includes the surrounding soil, which is the main heat sink.

327 (WHC-EP–0802) **1994 Solid waste forecast summary: Waste characteristics and treatability groups.** Valero, O.J. (Westinghouse Hanford Co., Richland, WA (United States)); Williams, N.C.; Armacost, L.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 292p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002473. Source: OSTI; NTIS; INIS; GPO Dep.

This document, prepared by Pacific Northwest Laboratory (PNL) under the direction of Westinghouse Hanford Company (WHC), describes the characteristics of the low-level mixed solid waste (LLMW) and transuranic/transuranic mixed solid waste (TRU/TRUM) that will be received at Hanford's Solid Waste Operations Complex (SWOC). This waste will be generated over the next 30 years from operations, maintenance activities, deactivation activities, decontamination and decommissioning (D&D) of facilities, and environmental restoration (ER) activities. For the past 4 years, each onsite and offsite waste generator has provided an annual forecast of the waste volume that is scheduled to be shipped to Hanford's Solid Waste Operations Complex (SWOC) over the next 30 years. The generator's forecast includes the waste volumes, waste classes, physical waste forms, hazardous constituents, and container types. Certain waste generators had a difficult time predicting their future waste volumes. Therefore, special studies and interviews were conducted to obtain these volumes. This document, based primarily on the 1993 forecasts, describes the physical waste forms and hazardous constituents for the low-level mixed waste (LLMW) and the transuranic/transuranic mixed waste (TRU/TRUM) that will be shipped to Hanford's SWOC. In addition, it illustrates how mixed waste is categorized into nationally established treatability groups. Defining the waste characteristics and categorizing the waste into treatability groups allows management and treatment planners to plan for future waste management activities and evaluate alternative treatment strategies.

328 (WHC-EP–0805) **Enhanced sludge washing evaluation plan.** Jensen, R.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001843. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) Program mission is to store, treat, and immobilize highly radioactive Hanford Site waste (current and future tank waste and the strontium/cesium capsules) in an environmentally sound, safe, and cost-effective manner. The scope of the TWRS Waste Pretreatment Program is to treat tank waste and separate that waste into HLW and LLW fractions and provide additional treatment as required to feed LLW and HLW immobilization facilities. Enhanced sludge washing was chosen as the baseline process for separating Hanford tank waste sludge. Section 1.0 briefly discusses the purpose of the evaluation plan and provides the background that led to the choice of enhanced sludge washing as the baseline process. Section 2.0 provides a brief summary of the evaluation plan details. Section 3.0 discusses, in some detail, the technical work planned to support the evaluation of enhanced sludge washing. Section 4.0 briefly discusses the potential important of policy issues to the evaluation. Section 5.0 discusses the methodology to be used in the evaluation process. Section 6.0 summarizes the milestones that have been defined to complete the enhanced sludge washing evaluation and provides a summary schedule to evaluate the performance of enhanced sludge washing. References are identified in Section 7.0, and additional schedule and milestone information is provided in the appendices.

329 (WHC-EP–0816) **Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout.** Epstein, M. (Fauske and Associates, Inc., Burr Ridge, IL (United States)); Fauske, H.K.; Dickinson, D.R.; Crippen, M.D.; McCormack, J.D.; Cash, R.J.; Meacham, J.E.; Simmons, C.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001578. Source: OSTI; NTIS; INIS; GPO Dep.

Much attention has been focused on the Hanford Site radioactive waste storage tanks as a results of problems that have been envisioned for them. One problem is the potential chemical reaction

between ferrocyanide precipitate particles and nitrates in the absence of water. This report addresses the question of whether dryout of a portion of ferrocyanide sludge would render it potentially reactive. Various sludge dryout mechanisms were examined to determine if any of them could occur. The mechanisms are: (1) bulk heating of the entire sludge inventory to its boiling point; (2) loss of liquid to the atmosphere via sludge surface evaporation; (3) local drying by boiling in a hot spot region; (4) sludge drainage through a leak in the tank wall; and (5) local drying by evaporation from a warm segment of surface sludge. From the simple analyses presented in this report and more detailed published analyses, it is evident that global loss of water from bulk heating of the sludge to its boiling point or from surface evaporation and vapor transport to the outside air is not credible. Also, from the analyses presented in this report and experimental and analytical work presented elsewhere, it is evident that formation of a dry local or global region of sludge as a result of tank leakage (draining of interstitial liquid) is not possible. Finally, and most importantly, it is concluded that formation of dry local regions in the ferrocyanide sludge by local hot spots or warm surface regions is not possible. The conclusion that local or global dryout is incredible is consistent with four decades of waste storage history, during which sludge temperature have gradually decreased or remained constant and the sludge moisture content has been retained. 54 refs.

330 (WHC-EP–0823) **Synthetic waste chemical mechanism studies.** Ashby, E.C. (Georgia Inst. of Tech., Atlanta, GA (United States)); Annis, A.; Barefield, E.K. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 177p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002971. Source: OSTI; NTIS; INIS; GPO Dep.

This research involved three main tasks: Kinetic studies of gas evolution and metal complexant decomposition in simulated waste media (SWM); Product identification from metal complexant decomposition in SWM; and Determination of the pathway by which N_2O, N_2, and NH_3 are formed in SWM. Results are given on these 3 tasks under the following subtitles: 1. Kinetic studies–Reactions of HEDTA in SWM at different temperatures; Determination of the activation energies for gas formation in HEDTA decomposition under argon; Kinetics and mechanism of thermal degradation of glycolate in SWM; A possible explanation for the temperature dependence of gaseous product ratios for reactions of HEDTA and glycolate; Stoichiometry and kinetics of decomposition of nitrosamines; and Factors affecting the reactions of HEDTA, EDTA, and related compounds in SWM; 2. Product identification–Identification of HEDTA degradation products using ^{13}C NMR spectroscopy; Identification of irradiated HEDTA degradation products using NMR; Degradation of model systems in SWM; and Role of Al in degradation of organic complexants; 3. Source of gases–Reactions in SY1-SIM-91B mixtures utilizing N-15 labelled reagents; Decomposition of nitrous oxide; Mechanistic pathways for formation of gases containing nitrogen from nitrite; and A redox analysis of HEDTA decomposition–How much ammonia might be formed?

331 (WHC-MR–0480) **Glass science tutorial: Lecture #2, Operating electric glass melters.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002965. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains basic information on electric furnaces used for glass melting and on the properties of glass useful for the stabilization of radioactive wastes. Furnace nomenclature, furnace types, typical silicate glass composition and properties, thermal conductivity information, kinetics of the melting process, glass furnace refractory materials composition and thermal conductivity, and equations required for the operation of glass melters are included.

332 (WHC-SA–1884) **Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances.** Conrads, T.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9310102–48: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE95001641. Source: OSTI; NTIS; INIS; GPO Dep.

In the fall of 1992, a draft of the Seismic Design and Evaluation Guidelines for the Department of Energy (DOE) High-level Waste Storage Tanks and Appurtenances was issued. The guidelines were prepared by the Tanks Seismic Experts Panel (TSEP) and this task was sponsored by DOE, Environmental Management. The TSEP is comprised of a number of consultants known for their knowledge of seismic ground motion and expertise in the analysis of structures, systems and components subjected to seismic loads. The development of these guidelines was managed by staff from Brookhaven National Laboratory, Engineering Research and Applications Division, Department of Nuclear Energy. This paper describes the process used to incorporate the Seismic Design and Evaluation Guidelines for the DOE High-Level Waste Storage Tanks and Appurtenances into the design criteria for the Multi-Function Waste Tank Project at the Hanford Site. This project will design and construct six new high-level waste tanks in the 200 Areas at the Hanford Site. This paper also discusses the vehicles used to ensure compliance to these guidelines throughout Title 1 and Title 2 design phases of the project as well as the strategy used to ensure consistent and cost-effective application of the guidelines by the structural analysts. The paper includes lessons learned and provides recommendations for other tank design projects which might employ the TSEP guidelines.

333 (WHC-SA–2302) **Remote automated material handling of radioactive waste containers.** Greager, T.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940602–20: 35. annual meeting of the American Nuclear Society, New Orleans, LA (United States), 11-16 Jun 1994). Order Number DE95001643. Source: OSTI; NTIS; INIS; GPO Dep.

To enhance personnel safety, improve productivity, and reduce costs, the design team incorporated a remote, automated stacker/retriever, automatic inspection, and automated guidance vehicle for material handling at the Enhanced Radioactive and Mixed Waste Storage Facility - Phase V (Phase V Storage Facility) on the Hanford Site in south-central Washington State. The Phase V Storage Facility, scheduled to begin operation in mid-1997, is the first low-cost facility of its kind to use this technology for handling drums. Since 1970, the Hanford Site's suspect transuranic (TRU) wastes and, more recently, mixed wastes (both low-level and TRU) have been accumulating in storage awaiting treatment and disposal. Currently, the Hanford Site is only capable of onsite disposal of radioactive low-level waste (LLW). Nonradioactive hazardous wastes must be shipped off site for treatment. The Waste Receiving and Processing (WRAP) facilities will provide the primary treatment capability for solid-waste storage at the Hanford Site. The Phase V Storage Facility, which accommodates 27,000 drum equivalents of contact-handled waste, will provide the following critical functions for the efficient operation of the WRAP facilities: (1) Shipping/Receiving; (2) Head Space Gas Sampling; (3) Inventory Control; (4) Storage; (5) Automated/Manual Material Handling.

334 (WHC-SA–2559) **A quality control program for waste disposal vault closure.** Benny, H.L. Westinghouse Hanford Co., Richland, WA (United States). Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940985–6: American Society for Quality Control Energy and Environmental Quality Division conference, Tucson, AZ (United States), 18-21 Sep 1994). Order Number DE94017995. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides a review of the quality control program employed for closure for a radioactive waste disposal vault at Hanford Washington. The major elements of the program are discussed, as well as the testing results and lessons learned.

335 (WHC-SD-CP-PLN–025) **Low-level waste certification plan for the WSCF Laboratory Complex.** Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001306. Source: OSTI; NTIS; INIS; GPO Dep.

The solid, low-level waste certification plan for the Waste Sampling and Characterization Facility (WSCF) describes the organization and methodology for the certification of the solid low-level waste (LLW) that is transferred to the Hanford Site 200 Areas Storage and Disposal Facilities. This plan incorporates the applicable elements of waste reduction, including up-front minimization, and end product treatment to reduce the volume or toxicity of the waste. The plan also includes segregation of different waste types. This low-level waste certification plan applies only to waste generated in, or is the responsibility of the WSCF Laboratory Complex. The WSCF Laboratory Complex supports technical activities performed at the Hanford Site. Wet Chemical and radiochemical analyses are performed to support site operations, including environmental and effluent monitoring, chemical processing, RCRA and CERCLA analysis, and waste management activities. Environmental and effluent samples include liquid effluents, ground and surface waters, soils, animals, vegetation, and air filters.

336 (WHC-SD-CP-PLN–026) **Low-level waste characterization plan for the WSCF Laboratory Complex.** Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002081. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Characterization Plan for the Waste Sampling and Characterization Facility (WSCF) complex describes the organization and methodology for characterization of all waste streams that are transferred from the WSCF Laboratory Complex to the Hanford Site 200 Areas Storage and Disposal Facilities. Waste generated at the WSCF complex typically originates from analytical or radiological procedures. Process knowledge is derived from these operations and should be considered an accurate description of WSCF generated waste. Sample contribution is accounted for in the laboratory waste designation process and unused or excess samples are returned to the originator for disposal. The report describes procedures and processes common to all waste streams; individual waste streams; and radionuclide characterization methodology.

337 (WHC-SD-CP-QAPP–015) **Quality assurance program plan for low-level waste at the WSCF Laboratory.** Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002082. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide guidance for the implementation of the Quality Assurance Program Plan (QAPP) for the management of low-level waste at the Waste Sampling and Characterization Facility (WSCF) Laboratory Complex as required by WHC-CM-4-2, Quality Assurance Manual, which is based on Quality Assurance Program Requirements for Nuclear Facilities, NQA-1 (ASME).

338 (WHC-SD-CP-TI–193) **Sludge Stabilization Campaign blend plan.** De Vries, M.L. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001635. Source: OSTI; NTIS; INIS; GPO Dep.

This sludge stabilization blend plan documents the material to be processed and the order of processing for the FY95 Sludge Stabilization Campaign. The primary mission of this process is to reduce the inventory of unstable plutonium bearing sludge. The source of the sludge is residual and glovebox floor sweepings from the production of material at the Plutonium Finishing Plant (PFP). The reactive sludge is currently being stored in various gloveboxes at PFP. There are two types of the plutonium bearing material that will be thermally stabilized in the muffle furnace: Plutonium Reclamation Facility (PRF) sludge and Remote Mechanical C (RMC) Line material.

339 (WHC-SD-EN-TI–280) **Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994.** Peterson, R.E. Westinghouse Hanford Co., Richland, WA (United States). 29 Aug 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018470. Source: OSTI; NTIS; INIS; GPO Dep.

Fuel storage basins associated with the 105-KE and 105-KW reactor buildings are currently being used to store irradiated fuel rods from past operations. Each reactor building contains a basin that holds approximately 1.3 million gal of water. The water provides a radiation shield, as well as a thermal sink for heat generated by the stored fuel. Some of the fuel rods stored in the K-East basin have damaged cladding and are stored in open canisters, allowing contact between the metallic uranium fuel and basin water. The interaction results in radionuclides being released to the basin water. Various exchange columns and filters associated with a closed-circuit circulation system are in place to reduce radionuclide concentrations in basin water. Tritium cannot be removed by these methods and is present in K-East basin water at a concentration of several million pCi/L. In contrast, K-West basin, where only fully encapsulated, undamaged fuel is stored, exhibits tritium concentrations at much lower levels–several hundred thousand pCi/L. The water budget for the basins includes water losses resulting from evaporation and possibly leakage, and the addition of make-up water to maintain a specific level. Water loss calculations are based on water level decreases during time intervals when no make-up water is added. A calculated loss rate beyond what is expected due to evaporation and uncertainty in the calculations, is assumed to be leakage to the soil column. Given sufficiently high leakage rates, and/or a preferential pathway for downward migration through the soil column, basin water may contaminate groundwater flowing beneath the basins.

340 (WHC-SD-EN-TI–290) **Geologic setting of the low-level burial grounds.** Lindsey, K.A. (CH2M Hill Hanford, Inc., Richland, WA (United States)); Jaeger, G.K.; Slate, J.L.; Swett, K.J.; Mercer, R.B. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002156. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the regional and site specific geology of the Hanford Sites low-level burial grounds in the 200 East and West Areas. The report incorporates data from boreholes across the entire 200 Areas, integrating the geology of this area into a single framework. Geologic cross-sections, isopach maps, and structure contour maps of all major geological units from the top of the Columbia River Basalt Group to the surface are included. The physical properties and characteristics of the major suprabasalt sedimentary units also are discussed.

341 (WHC-SD-GN-ISB–30001) **Hanford Generic Interim Safety Basis.** Lavender, J.C. Westinghouse Hanford Co., Richland, WA (United States). 9 Sep 1994. 392p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001568. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to identify WHC programs and requirements that are an integral part of the authorization basis for nuclear facilities that are generic to all WHC-managed facilities. The purpose of these programs is to implement the DOE Orders, as WHC becomes contractually obligated to implement them. The Hanford Generic ISB focuses on the institutional controls and safety requirements identified in DOE Order 5480.23, Nuclear Safety Analysis Reports.

342 (WHC-SD-HWV-SDP–004-Rev.1) **Small job development software project documentation for the activity management system: Revision 1.** Gates, T.A.; Burdick, M.B. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1994. 149p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95000986. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains all the required software development documentation as required by WHC-CM-3-10, software practices.

343 (WHC-SD-L045H-OTR–001) **Operability test report for the 300 Area Treated Effluent Disposal Facility.** Schermerhorn, D.S. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 336p. Sponsored by USDOE, Washington,

DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002364. Source: OSTI; NTIS; GPO Dep.

This document is an operability test report for the 300 area of the Hanford Reservation known as the Treated Effluent Disposal Facility. Topics discussed include: procedures for operating the Treated Effluent Disposal Facility, unloading sludge storage tanks, operating the waste collection sump, plant shutdown and the final conditions.

344 (WHC-SD-NR-CSER–013) **Critically safety evaluation for K Basins sandfilters.** Wittekind, W.D. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001840. Source: OSTI; NTIS; INIS; GPO Dep.

Criticality safety for K Basins sandfilters was considered. No credible normal or off-normal scenarios were determined which could compromise criticality safety and result in a $K_{eff} \geq 0.98$. The conclusion is that, due to the physical form and isotopic distribution of the fissionable material, there is no possibility of a nuclear criticality in the sandfilter. For this reason, there is no need for a criticality alarm system for the K Basins sandfilters.

345 (WHC-SD-PRP-HA–010) **Solid Waste Burial Grounds/ Central Waste Complex hazards assessment.** Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001596. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning Activities for Solid Waste Burial Grounds/ Central Waste Complex on the Hanford Site. The document represents an acceptable interpretation of the implementing guidance document for DOE Order 5500.3A. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is documented.

346 (WHC-SD-SNF-ER–003) **K-West and K-East basin thermal analyses for dry conditions.** Beaver, T.R.; Cramer, E.R.; Hinman, C.A. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001557. Source: OSTI; NTIS; INIS; GPO Dep.

Detailed 3 dimensional thermal analyses of the 100K East and 100 K West basins were conducted to determine the peak fuel temperature for intact fuel in the event of a complete loss of water from the basins. Thermal models for the building, an array of fuel encapsulation canisters on the basin floor, and the fuel within a single canister are described along with conservative predictions for the maximum expected temperatures for the loss of water event.

347 (WHC-SD-SNF-ES–003) **105KE and 105KW Basins fuel and sludge consolidation study, summary report.** Gant, R.G. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001519. Source: OSTI; NTIS; INIS; GPO Dep.

This study is a summary report that examines and evaluates the feasibility of consolidating irradiated fuel and sludge currently in KE Basin with that in the KW Basin. This study was conducted in support of TPA Milestone (target date) M-34-00-T03. The report summarizes three supporting engineering studies involving: (1) spent fuel consolidation into the single basin, (2) transport of the encapsulated fuel between KE and KW Basins, and (3) dispositioning contaminated water remaining in KE Basin. From the three reports, and preferred storage method, transfer method and water disposition method were defined. These consolidation methods were then evaluated against the no action alternative of continued storage using both KE and KW Basins. The report concluded that the fuel and sludge currently stored in KE Basin not be consolidated in the KW Basin, primarily due to increased cost and radiation exposure required to consolidate the fuel and sludge. Consolidation is more attractive for storage periods beyond the year 2002, which is the study period of the report.

348 (WHC-SD-SNF-PLN–001) **Waste management plan for Hanford spent nuclear fuel characterization activities.** Chastain, S.A. (Westinghouse Hanford Co., Richland, WA (United States)); Spinks, R.L. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002108. Source: OSTI; NTIS; INIS; GPO Dep.

A joint project was initiated between Westinghouse Hanford Company (WHC) and Pacific Northwest Laboratory (PNL) to address critical issues associated with the Spent Nuclear Fuel (SNF) stored at the Hanford Site. Recently, particular attention has been given to remediation of the SNF stored in the K Basins. A waste management plan (WMP) acceptable to both parties is required prior to the movement of selected material to the PNL facilities for examination. N Reactor and Single Pass Reactor (SPR) fuel has been stored for an extended period of time in the N Reactor, PUREX, K-East, and K-West Basins. Characterization plans call for transport of fuel material form the K Basins to the 327 Building Postirradiation Testing Laboratory (PTL) in the 300 Area for examination. However, PNL received a directive stating that no examination work will be started in PNL hot cell laboratories without an approved disposal route for all waste generated related to the activity. Thus, as part of the Characterization Program Management Plan for Hanford Spent Nuclear Fuel, a waste management plan which will ensure that wastes generated as a result of characterization activities conducted at PNL will be accepted by WHC for disposition is required. This document contains the details of the waste handling plan that utilizes, to the greatest extent possible, established waste handling and disposal practices at Hanford between PNL and WHC. Standard practices are sufficient to provides for disposal of most of the waste materials, however, special consideration must be given to the remnants of spent nuclear fuel elements following examination. Fuel element remnants will be repackaged in an acceptable container such as the single element canister and returned to the K Basins for storage.

349 (WHC-SD-SNF-TC–001) **Test procedure forms for sludge retrieval and packaging.** Feigenbutz, L.V. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001597. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides test procedure forms for sludge retrieval and packaging tests in the 305 Cold Test Facility. The completed and approved forms provide all descriptions, criteria and analysis to safely perform sludge equipment tests in the 305 Cold Test Facility.

350 (WHC-SD-SNF-WP–002) **Work plan for 105KE Basin seal conveyor relocation.** Tedeschi, D.J. Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001229. Source: OSTI; NTIS; GPO Dep.

This engineering work plan will support the activities of a pilot encapsulation of the spent fuel rods at 105KE Basin for the Hanford Site. The plan is to move and resue any existing encapsulation equipment in the Basin to another part of the Basin. This plan will discuss the activities involved in moving the seal conveyor system.

351 (WHC-SD-SQA-CSA–20377) **CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground.** Bhatia, S.L. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001637. Source: OSTI; NTIS; INIS; GPO Dep.

The restricted underground burial time of 20 years for galvanized drums and 18 years for painted drums was selected based on structural integrity analysis and the application of conservative criticality safety principles because there is no established reliable real life behavior (corrosion) test data on such 55 gallon standard drums buried under the environmental conditions at Hanford. Efforts have been made to establish data to support the extension of the design life of these drums. The data so far obtained suggest a drum lifetime of twice the current restricted value, but the body of data is not enough to conclude this amount of time with certainty. This Criticality Safety Evaluation Report (CSER) Addendum establishes the technical basis for extending the underground storage

time of only three drum sequences in the Hanford waste burial grounds which expire soon. The three drum sequences were originally scheduled for retrieval this year based on conservative assumptions about container lifetime in the burial ground. Evaluation of the recent retrieval data on physical contents of such containers and a corrosion study of the drums under the environmental conditions at Hanford burial grounds show that these drums can remain buried without loss of integrity much longer than the restricted storage time without posing any safety concern. Based on this review, it is concluded that a conditional approval of extending the underground storage time by 5 years beyond the expiration date(s) of these three placements is justified. This amendment will permit the Pilot Scale Retrieval operations of the buried drums for integrity inspection, drum material corrosion behavior, and inspection and repackaging of TRU waste currently underway at Hanford to proceed and to be in compliance with the applicable Criticality Prevention Specifications.

352 (WHC-SD-W026-OCD–001) **One-trip drum operating instruction.** Ruff, D.T. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001593. Source: OSTI; NTIS; INIS; GPO Dep.

The one trip system is a bagless transfer system for egress of waste from gloveboxes into 55 gallon one-trip drums. The contents of this document give an overview of the assembly, loading, and handling of the one-trip drum for use in the WRAP-1 plant.

353 (WHC-SD-W026-TI–006-Rev.1) **Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1.** Hinkle, A.W.; Jacobsen, P.H.; Lucas, D.R. Westinghouse Hanford Co., Richland, WA (United States). 30 Jun 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001838. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1, a 1991 Line Item, is planned for completion and start of operations in the spring of 1997. WRAP Module 1 will have the capability to characterize and repackage newly generated, retrieved and stored transuranic (TRU), TRU mixed, and suspect TRU waste for shipment to the Waste isolation Pilot Plant (WIPP). In addition, the WRAP Facility Module 1 will have the capability to characterize low-level mixed waste for treatment in WRAP Module 2A. This report documents the assumptions and cost estimates for decontamination and clean-up of a maximum possible fire loss (MPFL) as defined by DOE Order 5480.7A, FIRE PROTECTION. The Order defines MPFL as the value of property, excluding land, within a fire area, unless a fire hazards analysis demonstrates a lesser (or greater) loss potential. This assumes failure of both automatic fire suppression systems and manual fire fighting efforts. Estimates were developed for demolition, disposal, decontamination, and rebuilding. Total costs were estimated to be approximately $98M.

354 (WHC-SD-W026-TI–009) **Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1.** Mayancsik, B.A. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Kennewick, WA (United States). 13 Oct 1994. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002071. Source: OSTI; NTIS; INIS; GPO Dep.

During the next two decades, the transuranic (TRU) waste now stored in the 200 Area burial trenches and storage buildings is to be retrieved, processed in the Waste Receiving and Processing (WRAP) Module 1 facility, and shipped to a final disposal facility. The purpose of this document is to identify the criteria that can be used to batch suspect TRU waste, currently in retrievable storage, for processing through the WRAP Module 1 facility. These criteria are then used to generate a batch plan for Phase 1 Retrieval operations, which will retrieve the waste located in Trench 4C-04 of the 200 West Area burial ground. The reasons for batching wastes for processing in WRAP Module 1 include reducing the exposure of workers and the environment to hazardous material and ionizing radiation; maximizing the efficiency of the retrieval, processing, and disposal processes by reducing costs, time, and space throughout the process; reducing analytical sampling and analysis; and reducing the amount of cleanup and decontamination between process runs. The criteria selected for batching the drums of retrieved waste entering WRAP Module 1 are based on the available records for the wastes sent to storage as well as knowledge of the processes that generated these wastes. The batching criteria identified in this document include the following: waste generator; type of process used to generate or package the waste; physical waste form; content of hazardous/dangerous chemicals in the waste; radiochemical type and quantity of waste; drum weight; and special waste types. These criteria were applied to the waste drums currently stored in Trench 4C-04. At least one batching scheme is shown for each of the criteria listed above.

355 (WHC-SD-W026-TP–001) **Nondestructive examination development and demonstration plan.** Weber, J.R. Westinghouse Hanford Co., Richland, WA (United States). 21 Aug 1991. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001981. Source: OSTI; NTIS; INIS; GPO Dep.

Nondestructive examination (NDE) of waste matrices using penetrating radiation is by nature very subjective. Two candidate systems of examination have been identified for use in WRAP 1. This test plan describes a method for a comparative evaluation of different x-ray examination systems and techniques.

356 (WHC-SD-W026-TP–008) **Aerosol can puncture device operational test plan.** Leist, K.J. Westinghouse Hanford Co., Richland, WA (United States). 3 May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001842. Source: OSTI; NTIS; INIS; GPO Dep.

Puncturing of aerosol cans is performed in the Waste Receiving and Processing Facility Module 1 (WRAP 1) process as a requirement of the waste disposal acceptance criteria for both transuranic (TRU) waste and low-level waste (LLW). These cans have contained such things as paints, lubricating oils, paint removers, insecticides, and cleaning supplies which were used in radioactive facilities. Due to Westinghouse Hanford Company (WHC) Fire Protection concerns of the baseline system's fire/explosion proof characteristics, a study was undertaken to compare the baseline system's design to commercially available puncturing devices. While the study found no areas which might indicate a risk of fire or explosion, WHC Fire Protection determined that the puncturing system must have a demonstrated record of safe operation. This could be obtained either by testing the baseline design by an independent laboratory, or by substituting a commercially available device. As a result of these efforts, the commercially available Aerosolv can puncturing device was chosen to replace the baseline design. Two concerns were raised with the system. Premature blinding of the coalescing/carbon filter, due to its proximity to the puncture and draining operation; and overpressurization of the collection bottle due to its small volume and by blinding of the filter assembly. As a result of these concerns, testing was deemed necessary. The objective of this report is to outline test procedures for the Aerosolv.

357 (WHC-SD-W049H-ATP–001) **Acceptance test procedure for Project W-049H.** Buckles, D.I. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 29 Sep 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001516. Source: OSTI; NTIS; INIS; GPO Dep.

The Acceptance Test Procedure (ATP) program for Project W-049H (200 Area Treated Effluent Disposal Facility [TEDF]) covers three activities as follows: (1) Disposal System; (2) Collection System; and (3) Instrumentation and Control System. Each activity has its own ATP. The purpose of the ATPs is to reverify that the systems have been constructed in accordance with the construction documents and to demonstrate that the systems function as required by the Project criteria. The Disposal System ATP covers the testing of the following: disposal line flowmeters, room air temperatures in the Disposal Station Sampling Building, effluent valves and position indicators, disposal pond level monitors, automated sampler, pressure relief valves, and overflow diversion sluice gates.

The Collection System ATP covers the testing of the two pump stations and all equipment installed therein. The Instrumentation and Control (I and C) ATP covers the testing of the entire TEDF I and C system. This includes 3 OCS units, modem, and GPLI cabinets in the ETC control room; 2 pump stations; disposal station sampling building; and all LCUs installed in the field.

358 (WHC-SD-W059-ES–002) **B Plant retired HEPA filters engineering study (Project W-059).** Roege, P.E. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002088. Source: OSTI; NTIS; INIS; GPO Dep.

This document recommends a method to isolate the retired B Plant canyon exhaust HEPA filters from the ventilation system. The Engineering Study recommendation forms the basis for subsequent project design.

359 (WHC-SD-W100-ACDR–001) **WRAP 2A advanced conceptual design report comments.** Lamberd, D.L. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 426p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002114. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the compilation of the 393 comments that were submitted during the review of the Advanced Conceptual Design Report for the Waste Receiving and Processing Facility Module 2A. The report was prepared by Raytheon Engineers and Constructors, Inc. of Englewood, Colorado for the United States Department of Energy. The review was performed by a variety of organizations identified in the report. The comments were addressed first by the Westinghouse cognizant engineers and then by the Raytheon cognizant engineers, and incorporated into the final issue of the Advanced Conceptual Design Report.

360 (WHC-SD-W100-SDRD–001) **Waste Receiving and Packaging, Module 2A, Supplemental Design Requirements Document.** Lamberd, D.L.; Boothe, G.F.; Hinkle, A.L.; Horgos, R.M.; LeClair, M.D.; Nash, C.R.; Ocampo, V.P.; Pauly, T.R.; Stroup, J.L.; Weingardt, K.M. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001839. Source: OSTI; NTIS; INIS; GPO Dep.

The Supplemental Design Requirements Document (SDRD) is used to communicate plant design information from Westinghouse Hanford Company (WHC) to the US Department of Energy (DOE) and the cognizant Architect Engineer (A/E). Information in the SDRD serves two purposes: to convey design requirements that are too detailed for inclusion in a Functional Design Criteria (FDC) report; and to serve as a means of change control for design commitments in the Conceptual Design Report. The mission of WRAP 2A on the Hanford site is the treatment of contact handled low level mixed waste (MW) for final disposal. The overall systems engineering steps used to reach construction and operation of WRAP 2A are depicted in Figure 1. The WRAP 2A SDRD focuses on the requirements to address the functional analysis provided in Figure 1. This information is provided in sections 2 through 5 of this SDRD. The mission analysis and functional analysis are to be provided in a separate supporting document. The organization of sections 2 through 5 corresponds to the requirements identified in the WRAP 2A functional analysis.

361 (WHC-SD-W100-SP–001) **Waste Receiving and Processing Module 2A waste certification strategy.** LeClair, M.D. (Westinghouse Hanford Co., Richland, WA (United States)); Pottmeyer, J.A.; Hyre, R.A. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002112. Source: OSTI; NTIS; INIS; GPO Dep.

This document addresses the certification of Mixed Low Level Waste (MLLW) that will be treated in the Waste Receiving and Processing Facility Module 2A (WRAP 2A) and is destined for disposal in the MLLW trench of the Low Level Burial Grounds (LLBG). The MLLW that will be treated in WRAP 2A contains land disposal restricted and radioactive constituents. Certification of the treated waste is dependent on numerous waste management activities conducted throughout the WRAP 2A operation. These activities range from waste treatability testing conducted prior to WRAP 2A waste acceptance to overchecking final waste form quality prior to transferring waste to disposal. This document addresses the high level strategies and methodologies for certifying the final waste form. Integration among all design and verification activities that support final waste form quality assurance is also discussed. The information generated from this effort may directly support other ongoing activities including the WRAP 2A Waste Characterization Study, WRAP 2A Waste Analysis Plan development, Sample Plan development, and the WRAP 2A Data Management System functional requirements definition.

362 (WHC-SD-W100-TP–011) **CEL Working procedures for WRAP 2A formulation development test.** Duchsherer, M.J. Westinghouse Hanford Co., Richland, WA (United States). 2 Aug 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001520. Source: OSTI; NTIS; INIS; GPO Dep.

The WRAP 2A facility will encapsulate retrieved, stored, and newly generated contact-handled mixed low level waste (MLLW) into 55-500 gal cementitous forms. Standardized test procedures will be required to facilitate this process. Cementitous specimens will be prepared from simulated drum wastes and will be tested in the Chemical Engineering Laboratory using the laboratory operating/working procedures encorporated into this document.

363 (WHC-SD-W100-TP–014) **Phase III (full scale) agitated mixing test plan.** Ruff, D.T. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002109. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Receiving and Processing Facility Module 2A (WRAP 2A) is the proposed second module of the WRAP facility. This facility will provide the required treatment for contact Handled (CH) Low Level (LL) Mixed Waste (MW) to allow its permanent disposal. Solidification of a portion of this waste using a cement based grout has been selected in order to reduce the toxicity and mobility of the waste in the disposal site. Mixing of the waste with the cement paste and material handling constraints/requirements associated with the mixed material is, therefore, a key process in the overall treatment strategy. This test plan addresses Phase 3, Full Scale Testing. The objectives of these tests are to determine if there are scale-up issues associated with the mixing results obtained in Phase 1 and 2 mixing tests, verify the workability of mixtures resulting from previous formulation development efforts (Waste Immobilization Development [WID]), and provide a baseline for WRAP 2A mixing equipment design. To this end, the following objectives are of particular interest: determine geometric influence of mixing blade at full scale (i.e., size, type, and location: height/offset); determine if similar results in terms of mixing effectiveness and product quality are achievable at this scale; determine if vibration is as effective at this larger scale in fluidizing the mixture and aiding in cleaning the vessel; determine if baffles or sweeping blades are needed to aid in mixing at the larger size and for cleaning the vessel; and determine quality of the poured monolithic product and investigate exotherm and filling influences at this larger size.

364 (WHC-SD-W112-ES–006) **Solid waste management complex site development plan.** Greager, T.M. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001600. Source: OSTI; NTIS; INIS; GPO Dep.

The main purpose of this Solid Waste Management Complex Site Development Plan is to optimize the location of future solid waste treatment and storage facilities and the infrastructure required to support them. An overall site plan is recommended. Further, a series of layouts are included that depict site conditions as facilities are constructed at the SWMC site. In this respect the report serves not only as the siting basis for future projects, but provides siting guidance for Project W-112, as well. The plan is intended to function as a template for expected growth of the site over the next 30 years so that future facilities and infrastructure will be properly integrated.

365 (WHC-SD-W236A-ER–011) **Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility.** Awadalla, N.G. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001436. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-236a, Multi-function waste Tank Facility (MWTF), was initiated to increase the safe waste storage capacity for the Tank Waste Remediation System (TWRS) by building two new one million gallon underground storage tanks in the 200 West Area and four tanks in the 200 East Area. Construction of the tanks was scheduled to begin in September 1994 with operations beginning in calendar year (CY) 1998. However, recent reviews have raised several issues regarding the mission, scope, and schedule of the MWTF. The decision to build new tanks must consider several elements, such as: Operational risk and needs – Operational risk and flexibility must be managed such that any identified risk is reduced as soon as practicable; The amount of waste that will be generated in the future – Additional needed tank capacity must be made available to support operations and maintain currently planned safety improvement activities; Safety issues – The retrieval of waste from single-shell tanks (SSTs) and watch list tanks will add to the total amount of waste that must be stored in a double-shell tank (DST); Availability of existing DSTs – The integrity of the 28 existing DSTs must be continuously managed; and Affect on other projects and programs – Because MWTF systems have been integrated with other projects, a decision on one project will affect another. In addition the W-236a schedule is logically tied to support retrieval and safety program plans. Based on the above, two new tanks are needed for safe waste storage in the 200 West Area, and they need to be built as soon as practicable. Design should continue for the tanks in the 200 East Area with a decision made by September, on whether to construct them. Construction of the cross-site transfer line should proceed as scheduled. To implement this recommendation several actions need to be implemented.

366 (WHC-SD-W306-PAP–001) **Solid waste operations complex engineering verification program plan.** Bergeson, C.L. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002073. Source: OSTI; NTIS; INIS; GPO Dep.

This plan supersedes, but does not replace, the previous Waste Receiving and Processing/Solid Waste Engineering Development Program Plan. In doing this, it does not repeat the basic definitions of the various types or classes of development activities nor provide the rigorous written description of each facility and assign the equipment to development classes. The methodology described in the previous document is still valid and was used to determine the types of verification efforts required. This Engineering Verification Program Plan will be updated on a yearly basis. This EVPP provides programmatic definition of all engineering verification activities for the following SWOC projects: (1) Project W-026 - Waste Receiving and Processing Facility Module 1; (2) Project W-100 - Waste Receiving and Processing Facility Module 2A; (3) Project W-112 - Phase V Storage Facility; and (4) Project W-113 - Solid Waste Retrieval. No engineering verification activities are defined for Project W-112 as no verification work was identified. The Acceptance Test Procedures/Operational Test Procedures will be part of each project's Title III operation test efforts. The ATPs/OTPs are not covered by this EVPP.

367 (WHC-SD-W306-TI–002) **Evaluation of hydrogen buildup in radioactive mixed waste drums.** Brunson, M.L.; Perkins, E.A. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002362. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study is to evaluate the potential for hydrogen gas buildup and the quantity that could be generated to produce an explosion in radioactive mixed waste drums, caused by chemical reactions. This study evaluates the potential for hydrogen gas buildup and the quantity that could be generated to produce an explosion in radioactive mixed waste (RMW) drums due to chemical reactions.

368 (WHC-SD-W378-ES–001) **Low level tank waste disposal study.** Mullally, J.A. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Albuquerque, NM (United States); British Nuclear Fuels plc, Risley (United Kingdom); Southwest Research Inst., San Antonio, TX (United States); TRW, Inc., Redondo Beach, CA (United States). 29 Sep 1994. 379p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001532. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company (WHC) contracted a team consisting of Los Alamos Technical Associates (LATA), British Nuclear Fuel Laboratories (BNFL), Southwest Research Institute (SwRI), and TRW through the Tank Waste Remediation System (TWRS) Technical Support Contract to conduct a study on several areas concerning vitrification and disposal of low-level-waste (LLW). The purpose of the study was to investigate how several parameters could be specified to achieve full compliance with regulations. The most restrictive regulation governing this disposal activity is the National Primary Drinking Water Act which sets the limits of exposure to 4 mrem per year for a person drinking two liters of ground water daily. To fully comply, this constraint would be met independently of the passage of time. In addition, another key factor in the investigation was the capability to retrieve the disposed waste during the first 50 years as specified in Department of Energy (DOE) Order 5820.2A. The objective of the project was to develop a strategy for effective long-term disposal of the low-level waste at the Hanford site.

369 (WHC-SD-WM-ANAL–033-Vol.2) **241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2.** Julyk, L.J.; Baliga, R. Westinghouse Hanford Co., Richland, WA (United States). 16 Aug 1994. 277p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018728. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains compiled data of supplemental gravity load analyses for radioactive storage tanks.

370 (WHC-SD-WM-ANAL–034-Vol.1) **241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1.** Baliga, R. Westinghouse Hanford Co., Richland, WA (United States). 26 Aug 1994. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018467. Source: OSTI; NTIS; INIS; GPO Dep.

An analysis of the 241SY tanks performed by ADVENT(1994b) to resolve dome overload issues indicated that the tank can sustain the dome loads resulting from additional soil overburden depth, increased soil density, and increased concentrated load. Similar issues exist for the 241AY/AZ tanks and therefore, an interim analysis of the 241AY/AZ tanks is presented herein. The scope of this effort is to review and compare all design drawings pertaining to the 241AY and 241AZ tanks with those pertaining to the 241SY tanks; to modify the axisymmetric model of the 241SY tanks to represent the 241AY/AZ tanks; and to evaluate the effect of additional dome load on the 241AY/AZ tanks by performing a structural analysis for gravity loads (dead load + live load). ADVENTS's additional scope of work is to perform a qualitative evaluation of the 241AY/AZ tanks for seismic and thermal loadings (Vollert 1982 and Blume 1971). This qualitative evaluation does not include any detailed finite element analysis of the tanks. The following design-based gravity loading conditions are used in this interim analysis of the 241AY/AZ tanks to determine a baseline for the tank stresses or section loads.

371 (WHC-SD-WM-ANAL–034-Vol.2) **241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2.** Julyk, L.J.; Baliga, R. Westinghouse Hanford Co., Richland, WA (United States). 17 Aug 1994. 546p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018468. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains compiled data of supplemental gravity load analyses for radioactive storage tanks.

372 (WHC-SD-WM-ATP–023-Rev.5) **Tank Monitor and Control System sensor acceptance test procedure: Revision 5.** Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001560. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this acceptance test procedure (ATP) is to verify the correct reading of sensor elements connected to the Tank Monitor and Control System (TMACS). This ATP is intended to be used for testing of the connection of existing temperature sensors, new temperature sensors, pressure sensing equipment, new Engraf level gauges, sensors that generate a current output, and discrete (on/off) inputs. It is intended that this ATP will be used each time sensors are added to the system. As a result, the data sheets have been designed to be generic. The TMACS has been designed in response to recommendations from the Defense Nuclear Facilities Safety Board primarily for improved monitoring of waste tank temperatures. The system has been designed with the capability to monitor other types of sensor input as well.

373 (WHC-SD-WM-ATP–082) **DACS upgrade acceptance test procedure.** Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001373. Source: OSTI; NTIS; INIS; GPO Dep.

The readiness of the Data Acquisition and Control System (DACS) to provide monitoring and control of the mixer pump, directional drive system, and the instrumentation associated with the SY-101 tank and support systems, and the proper functioning of the DACS with new Model 984-785 Programmable Logic Controllers (PLCs), new MODBUS PLUS version 2.01 software for the PLCs, and version 3.72 of the GENESIS software will be systematically evaluated by performance of this procedure. The DACS, which is housed in a trailer located just outside of the north fence at the SY tank farm, receives input signals from a variety of sensors located in and around the SY-101 tanks. These sensors provide information such as: tank vapor space and ventilation system H_2 concentration; tank waste temperature; tank pressure; waste density; operating pump parameters such as speed, flow, rotational position, discharge pressure, and internal temperature; strain (for major equipment); and waste level. The output of these sensors is conditioned and transmitted to the DACS computers where these signals are displayed, recorded, and monitored for out-of-specification conditions. If abnormal conditions are detected, then, in certain situations, the DACS automatically generates alarms and causes the system to abort pump operations.

374 (WHC-SD-WM-ATP–100) **Acceptance test procedure, 241-SY-101/241-C-106 shot loading system.** Ostrom, M.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002142. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure is for the 241-SY-101/241-C-106 Shot Loading System. The procedure will test the components of the Shot Loading System and its capability of adequately loading shot into the annular space of the Container. The loaded shot will provide shielding as required for transporting and storage of a contaminated pump after removal from the tank. This test serves as verification that the SLS is acceptable for use in the pump removal operations for Tanks 241-SY-101, 241-C-106 and 241-AY-102. The pump removal operation for these three tanks will be performed by two different organizations with different equipment, but the Shot Loading System will be compatible between the two operations.

375 (WHC-SD-WM-ATR–044) **Acceptance test report for 241-AW process air system.** Kostelnik, A.J. Westinghouse Hanford Co., Richland, WA (United States). 6 Oct 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002237. Source: OSTI; NTIS; INIS; GPO Dep.

The acceptance test procedure (ATP) for the compressed air system at building 241-AW-273 was completed on March 11, 1993. The system was upgraded to provide a reliable source of compressed air to the tank farm. The upgrade included the demolition of the existing air compressor and associated piping, as well as the installation of a new air compressor with a closed loop cooling system. A compressed air cross-tie was added to allow the process air compressor to function as a back-up to the existing instrument air compressor. The purpose of the ATP was to achieve three primary objectives: verify system upgrade in accordance with the design media; provide functional test of system components and controls; and prepare the system for the Operational Test. The ATP was successfully completed with thirteen exceptions, which were resolved prior to completing the acceptance test. The repaired exceptions had no impact to safety or the environment and are briefly summarized. Testing ensured that the system was installed per design, that its components function as required and that it is ready for operational testing and subsequent turnover to operations.

376 (WHC-SD-WM-ATR–098) **GMS/DACS interface acceptance test report.** Zuehlke, A.C. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002075. Source: OSTI; NTIS; INIS; GPO Dep.

The DACS, which is housed in a trailer located just outside of the north fence at the SY tank farm, receives input signals from a variety of sensors located in and around the SY-101 tank. These sensors provide information such as: tank vapor space and ventilation system H_2 concentration; tank waste temperature; tank pressure; waste density; operating pump parameters such as speed, flow, rotational position, discharge pressure, and internal temperature; strain (for major equipment); and waste level. The output of these sensors is conditioned and transmitted to the DACS computers where these signals are displayed, recorded, and monitored for out-of-specification conditions. If abnormal conditions are detected, then, in certain situations, the DACS automatically generates alarms and causes the system to abort pump operations. The portions of the system to be tested include: new RGA5 gas monitor; existing gas chromatographs; FTIR; B and K (Photo) NH_3 equipment; any new or changed Genesis screens; and I/O Drop 13.

377 (WHC-SD-WM-CSCM–027) **System configuration management plan for 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System.** Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002280. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Standard defines the configuration management program by the five basic program elements of "program management," "design requirements," "document control," "change control," and "assessments," and the two adjunct recovery programs of "design reconstitution," and "material condition and aging management. The C-M model of five elements and two adjunct programs strengthen the necessary technical and administrative control to establish and maintain a consistent technical relationship among the requirements, physical configuration, and documentation. Although the DOE Standard was originally developed for the operational phase of nuclear facilities, this plan has the flexibility to be adapted and applied to all life-cycle phases of both nuclear and non-nuclear facilities. The configuration management criteria presented in this plan endorses the DOE Standard and has been tailored specifically to address the technical relationship of requirements, physical configuration, and documentation during the full life-cycle of the 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System.

378 (WHC-SD-WM-CSRS–016) **Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1).** McNeece, S.G.; Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002146. Source: OSTI; NTIS; INIS; GPO Dep.

The system requirements specification for SY-101 hydrogen mitigation test project (HMTP) data acquisition and control system (DACS-1) documents the system requirements for the DACS-1

project. The purpose of the DACS is to provide data acquisition and control capabilities for the hydrogen mitigation testing of Tank SY-101. Mitigation testing uses a pump immersed in the waste, directed at varying angles and operated at different speeds and time durations. Tank and supporting instrumentation is brought into the DACS to monitor the status of the tank and to provide information on the effectiveness of the mitigation test. Instrumentation is also provided for closed loop control of the pump operation. DACS is also capable for being expanded to control and monitor other mitigation testing. The intended audience for the computer system requirements specification includes the SY-101 hydrogen mitigation test data acquisition and control system designers: analysts, programmers, instrument engineers, operators, maintainers. It is intended for the data users: tank farm operations, mitigation test engineers, the Test Review Group (TRG), data management support staff, data analysis, Hanford data stewards, and external reviewers.

379 (WHC-SD-WM-DA–157) **Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump.** Jones, K.M. Westinghouse Hanford Co., Richland, WA (United States). 9 Sep 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003052. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the structural analysis of the flexible-receiver yoke brace that will be used to maintain the mixer pump lifting yoke in a vertical position during the removal of the mixer pump from waste tank 241SY101. During the removal process, the crane is connected to a lifting yoke which is attached to the lifting on the mounting flange of the mixer pump. The pump then can be lifted from the tank. At one point in the removal procedure, the crane will be disconnected from the lifting yoke. At this time, it is possible for the lifting yoke to rotate around the pinned connection between it and the pump if it is subjected to a horizontal load. To prevent the rotation of the lifting yoke, the yoke brace was designed to maintain the yoke in a vertical position while it is disconnected from the crane. This analysis addressed the adequacy of the yoke brace to provide support for the lifting yoke during high winds and a seismic event. The results of this analysis show that, when subjected to a combined design wind and seismic load, the yoke brace design is acceptable to maintain the lifting yoke in a vertical position when the yoke is disconnected from the crane.

380 (WHC-SD-WM-DA–163) **Structural analysis of color video camera installation on tank 241AW101 (2 Volumes).** Strehlow, J.P. Westinghouse Hanford Co., Richland, WA (United States). 24 Aug 1994. 317p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018441. Source: OSTI; NTIS; INIS; GPO Dep.

A video camera is planned to be installed on the radioactive storage tank 241AW101 at the DOE' s Hanford Site in Richland, Washington. The camera will occupy the 20 inch port of the Multi-port Flange riser which is to be installed on riser 5B of the 241AW101 (3,5,10). The objective of the project reported herein was to perform a seismic analysis and evaluation of the structural components of the camera for a postulated Design Basis Earthquake (DBE) per the reference Structural Design Specification (SDS) document (6). The detail of supporting engineering calculations is documented in URS/Blume Calculation No. 66481-01-CA-03 (1).

381 (WHC-SD-WM-DGS–001) **Radiological containment selection, design, and specification guide.** Brown, R.L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002093. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance to Tank Waste Remediation Systems personnel in determining what containment is appropriate for work activities, what containments are available, general applications of each, design criteria, and other information needed to make informed decisions concerning containment application.

382 (WHC-SD-WM-DP–071) **95-1 Campaign evaporator boildown results.** Miller, G.L. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002115. Source: OSTI; NTIS; INIS; GPO Dep.

The Process Chemistry Laboratories were requested to support the 242-A Evaporator restart as part of the overall 222-S laboratory effort. The net purpose of these studies is to determine the characteristics of double-shell tank materials as they are processed in the evaporator. The results for the boildown study (which includes pressure and temperature versus % waste volume reduction and density of final boildown residue) supporting the 242-A Evaporator restart are reported below. The boildown was performed in a vacuum distillation apparatus with an adjustable vacuum limiting manometer and an isolatable collection graduated cylinder. The boildown was conducted over a seven hour period. The evaporation was done at 60 torr (to avoid excessive foaming and bumping of solution) for approximately half of the boildown, the pressure then being reduced to 40 torr when the reduction in solution volume allowed this to be done. Percent waste volume reduction was measured by observing the amount of condensate collected in a graduated cylinder. As the graduated cylinder became full, it was isolated from the rest of the system and the condensate removed. Pressure was set using an electronic manometer with a low pressure limiter set at the desired level. Temperature was measured using a J-type thermocouple. The apparatus was calibrated by observing the pressure versus temperature response of pure water, and comparing the values thus obtained to published values.

383 (WHC-SD-WM-DQO–014) **242-A Evaporator/Liquid Effluent Retention Facility data quality objectives.** Von Bargen, B.H. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 226p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001434. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of data quality objectives (DQO) is to determine the most cost effective methods of gathering the essential data necessary to make decisions to support successful operation of the facility. The essential data is defined by such information as sample amount, sample location, required analyses, and how sampling and analyses are performed. Successful operation is defined as meeting the campaign objectives while operating within established requirements. This DQO document addresses that portion of the system from 242-A Evaporator candidate feed tanks through discharge of process condensate to the Liquid Effluent Retention of Facility (LERF). Later revisions will incorporate and integrate the entire system, including the Effluent Treatment Facility (ETF).

384 (WHC-SD-WM-DTR–036) **Clean Salt integrated flowsheet.** Lunsford, T.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001375. Source: OSTI; NTIS; INIS; GPO Dep.

The Clean Salt Process (CSP) is a novel waste management scheme that removes sodium nitrate and aluminum nitrate nonahydrate as decontaminated (low specific activity) salts from Hanford's high-level waste (HLW). The full scale process will separate the bulk of the waste that exists as sodium salts from the small portion of the waste that is by definition radioactive and dangerous. This report presents initial conceptual CSP flowsheets and demonstrates the benefit of integrating the process into the Tank Waste Remediation Systems (TWRS) Reference Flowsheet. Total HLW and low-level (LLW) volumes are reported for two different CSP integration options and are compared to the TWRS Reference Flowsheet values. The results for a single glass option eliminating LLW disposal are also reported.

385 (WHC-SD-WM-ER–308) **Supporting document for the historical tank content estimate for A Tank Farm.** Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 743p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001898. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200-East Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and

Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to the SSTs in the A Tank Farm of the northeast quadrant of the 200 East Area. Nine appendices compile data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

386 (WHC-SD-WM-ER–309) **Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm.** Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 440p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001980. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical in-depth characterization information gathered in AX-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate Report of the NE Quadrant and the Hanford 200 East Areas.

387 (WHC-SD-WM-ER–310) **Supporting document for the historical tank content estimate for B Tank Farm.** Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 740p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001983. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200-East Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to the SSTs in the B Tank Farm of the northeast quadrant of the 200 East Area. Nine appendices compile data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

388 (WHC-SD-WM-ER–311) **Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm.** Brevick, C.H. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 816p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001900. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides historical in-depth characterization information gathered on BX-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate Report of the NE Quandrant and the Hanford 200 East Areas.

389 (WHC-SD-WM-ER–312) **Supporting document for the historical tank content estimate for BY Tank Farm.** Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 992p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001901. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200-East Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to the SSTs in the BY Tank Farm of the northeast quadrant of the 200 East Area. Nine appendices contain data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

390 (WHC-SD-WM-ER–313) **Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm.** Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 1254p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001982. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical in-depth characterization information gathered on C-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate Report of the NE Quadrant and the Hanford 200 East Areas.

391 (WHC-SD-WM-ER–323) **Supporting document for the historical tank content estimate for S tank farm.** Brevick, C.H.; Gaddis, L.A.; Walsh, A.C. ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1994. 1243p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001979. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive mixed wastes stored in the Hanford Site 200 West Area underground single-shell tanks (SSTs). A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy (DOE) and Department of Defense (DOD) contractors. The historical data will supplement information gathered from in-tank core sampling activities that are currently underway. A tank history review that is accompanied by current characterization data creates a complete and reliable inventory estimate. Additionally, historical review of the tanks may reveal anomalies or unusual contents that are critical to characterization and post characterization activities. Complete and accurate tank waste characterizations are critical first steps for DOE and Westinghouse Hanford Company safety programs, waste pretreatment, and waste retrieval activities. The scope of this document is limited to all the SSTs in the S Tank Farm of the southwest quadrant of the 200 West Area. Nine appendices compile data on: tank level histories; temperature graphs; surface level graphs; drywell graphs; riser configuration and tank cross section; sampling data; tank photographs; unknown tank transfers; and tank layering comparison. 113 refs.

392 (WHC-SD-WM-ER–324) **Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm.** Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 1300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001899. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical characterization information gathered on SX-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate of the SW Quadrant at the Hanford 200 West Area.

393 (WHC-SD-WM-ER–325) **Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm.** Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 1030p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002233. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document provides historical characterization information gathered on U-Tank Farm, such as historical waste transfer and level data, tank physical information, temperature data, sampling data, and drywell and liquid observation well data for Historical Tank Content Estimate of the SW Quadrant at the Hanford 200 West Area.

394 (WHC-SD-WM-ER–363) **Tank characterization report for double-shell Tank 241-AW-102.** DiCenso, A.T. (Los Alamos Technical Associates, Kennewick, WA (United States)); Amato, L.C.; Franklin, J.D.; Nuttall, G.L.; Tran, T.T.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Kennewick, WA (United States). 28 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001468. Source: OSTI; NTIS; INIS; GPO Dep.

This Tank Characterization Report presents an overview of the waste transfer history of Tank 241-AW-102 and contains observations regarding waste characteristics which resulted from the 242-A Evaporator Campaign 94-1. The purpose of this report is to describe and characterize the waste in Tank 241-AW-102 based on information obtained from various sources. Specific objectives for the sampling and characterization of the waste in Tank 241-AW-102 are to: Contribute toward the fulfillment of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) concerning the characterization of Hanford Site high-level radioactive waste tanks and provide tank waste characterization to the Tank Waste Remediation System (TWRS) Program Elements in accordance with the TWRS Tank Waste Analysis Plan. This report deviates from the standard format for Tank Characterization Reports because of the special nature of the tank. (Tank 241-AW-102 is the designated feed tank for the 242-A Evaporator; consequently, its level and waste composition are constantly changing.) Instead, a broad description of the tank and its historical background are presented. An estimation of the contents of Tank 241-AW-102 based on data presented in O'Rourke (1994) is also presented in this document. Finally, specific safety issues and program element needs are discussed.

395 (WHC-SD-WM-ER–364) **Tank characterization report for double-shell Tank 241-AW-105.** DiCenso, A.T. (Los Alamos Technical Associates, Kennewick, WA (United States)); Amato, L.C.; Franklin, J.D.; Lambie, R.W.; Stephens, R.H.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Kennewick, WA (United States). 28 Sep 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001407. Source: OSTI; NTIS; INIS; GPO Dep.

In May 1990, double-shell Tank 241-AW-105 was sampled to determine proper handling of the waste, to address corrosivity and compatibility issues, and to comply with requirements of the Washington Administrative Code. This Tank Characterization Report presents an overview of that tank sampling and analysis effort, and contains observations regarding waste characteristics. It also addresses expected concentration and bulk inventory data for the waste contents based on this latest sampling data and background tank information. This report summarizes the available information regarding the waste in Tank 241-AW-105, and using the historical information to place the analytical data in context, arranges this information in a useful format for making management and technical decisions concerning this waste tank. In addition, conclusions and recommendations are given based on safety issues and further characterization needs.

396 (WHC-SD-WM-ER–382) **Tank characterization report for Single-Shell Tank 241-T-107.** Valenzuela, B.D.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 179p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002095. Source: OSTI; NTIS; INIS; GPO Dep.

Single shell tank 241-T-107 is a Hanford Site Ferrocyanide Watch List tank most recently sampled in March 1993. Analyses of materials obtained from tank T-107 were conducted to support the Ferrocyanide Unreviewed Safety Question (USQ) and the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-10-06 as well as Milestones M-44-05 and M-44-07. Characterization of the tank waste T-107 will support the ferrocyanide safety issue in order to classify the tank as safe, conditionally safe, or unsafe. This tank characterization report expands on the data found in Ferrocyanide Safety Program: Data Interpretation Report for Tank 241-T-107 Core Samples. Analysis of core samples obtained from tank T-107 strongly indicate the cyanide and oxidizer (nitrate/nitrite) concentrations in the tank waste are not significant enough to support a self-sustaining exothermic reaction. Therefore, the contents of tank T-107 present no imminent threat to the workers at the Hanford Site, the public, or the environment. Because the possibility of an exothermic reaction is remote, the consequences of an accident scenario, as proposed by the General Accounting Office, are not applicable.

397 (WHC-SD-WM-ER–387) **Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor).** Wootan, D.W.; Bolden, R.C.; Bridges, A.E.; Cannon, N.S.; Chastain, S.A.; Hey, B.E.; Knight, R.C.; Linschooten, C.G.; Pitner, A.L.; Webb, B.J. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002091. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes work performs in Fiscal Year 1994 to develop the three main components of Retained Gas Sampler System (RGSS). These primary components are the Retained Gas Sampler (RGS), the Retained Gas Extruder (RGE), and the Retained Gas Extractor (RGEx). The RGS is based on the Westinghouse Hanford Company (WHC) Universal Sampler design, and includes modifications to reduce gas leakage. The primary data priorities for the RGSS are to measure the void fraction and the flammable gas concentration in the waste sample. Significant progress has been made in developing the RGSS. The RGSS is being developed by WHC to extract a representative waste sample from a Flammable Gas Watch List Tanks and to measure both the amount and composition of free and "bound" gases. Sudden releases of flammable gas mixtures are a safety concern for normal waste storage operations and eventual waste retrieval. Flow visualization testing was used to identify important fluid dynamic issues related to the sampling process. The primary data priorities for the RGSS are to measure the void fraction and the flammable gas concentration in the waste sample. The safety analysis for the RGSS is being performed by Los Alamos National Laboratory and is more than sixty percent (60%) complete.

398 (WHC-SD-WM-ETP–0106) **In situ sampling device development engineering task plan.** DeFord, D.K. Westinghouse Hanford Co., Richland, WA (United States). 7 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002236. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering task plan (ETP) supports the development for facility use of an improved packaging method or device for the sorbent media used during in situ sampling of waste tanks. Improvement is being sought due to problems with internal and external radioactive contamination. In situ sampling refers to placing sample collection media (primarily sorbent tubes) directly into the tank headspace, then drawing tank gases through the collection media to obtain samples. Development for facility use, includes design, fabrication, and formal documentation of the device. As the most important change to be made is addition of a High Efficiency

Particulate Air (HEPA) filter, the device will be referred to in this ETP as the Filter Device or simply the Device. This ETP is intended to be the management plan governing the design, fabrication, and formal documentation of the Filter Device. This plan identifies the engineering services and other resources to accomplish that purpose. The design basis for the development of the Device is presented in this ETP.

399 (WHC-SD-WM-ETP–122) **Engineering task plan for steam line ramp calculations.** DeSantis, G.N.; Freeman, R.D. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002076. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide an approved work plan to perform calculations that verify the load limits of a proposed ramp over a steam line at the back side (East side) of SY Farm in support of work package 2W-94-00812/K. The objective of this supporting document is to provide Operations with a set of checked calculations that verify the ramp over the steam line at SY Farm will support a fully loaded concrete mixer truck without affecting the steam line. The calculations will be performed by an engineers from Facility Systems and independently checked and reviewed by another engineer. The calculations may then be added to the work package. If Operations decides to make any configuration changes to the steam line or surrounding area, Operations shall have these changes documented by an Engineering Change Notice (ECN). This ECN can be done by Facility Systems or any other engineering organization at the direction of Operations.

400 (WHC-SD-WM-EV–025-Rev.1) **B Plant Complex pollution prevention plan: Revision 1.** Beam, T.G. Westinghouse Hanford Co., Richland, WA (United States). 13 Oct 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002235. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has directed Westinghouse Hanford Company (WHC) to develop an effective strategy to minimize the generation of hazardous, radioactive, and mixed wastes at Hanford in compliance with state and federal regulations. WHC has formalized a pollution prevention program composed of management policies, management requirements and procedures. This plan addresses pollution prevention for B Plant Complex. A pollution prevention team is in place and has been assigned responsibility for implementing the plan. This plan includes actions and goals for reducing volume and toxicity of waste generated, as well as a basis for evaluation of progress. Descriptions of waste streams, current specific goals, general pollution prevention methods, and specific accomplishments are in the appendices of this plan.

401 (WHC-SD-WM-EV–060-Rev.4) **242-A Evaporator waste analysis plan: Revision 4.** Basra, T.S.; Mulkey, C.H. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 30p. DOE Contract AC06-87RL10930. Order Number DE95001374. Source: OSTI; NTIS; INIS; GPO Dep.

This waste analysis plan (WAP) provides the plan for obtaining information needed for proper waste handling and processing in the 242-A Evaporator located on the Hanford Site. Regulatory and safety issues are addressed by establishing boundary conditions for waste received and treated at the 242-A Evaporator. The boundary conditions are set by establishing limits for items such as potential exothermic reactions, waste compatibility, and control of vessel vent organic emissions. Boundary conditions are also set for operational considerations and to ensure waste acceptance at receiving facilities. The issues that are addressed in this plan include prevention of exotherms in the waste, waste compatibility, vessel vent emissions, and compatibility with the liner in the Liquid Effluent Retention Facility (LERF). The 242-A Evaporator feed stream is separated into two liquid streams: a concentrated slurry stream and a process condensate. A gaseous exhaust stream is also produced. The slurry contains the majority of the radionuclides and inorganic constituents. This stream is pumped back to the double shell tanks (DSTs) and stored for further treatment after being concentrated to target levels. The process condensate (PC) is primarily water that contains trace amounts of organic material and a greatly reduced concentration of radionuclides. The process condensate is presently stored in the (LERF) until it can be further processed in the Effluent Treatment Facility once it is operational.

402 (WHC-SD-WM-FDC–031) **Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1).** Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002160. Source: OSTI; NTIS; INIS; GPO Dep.

Early in 1990, the potential for a large quantity of hydrogen and nitrous oxide to exist as an explosive mixture within some Hanford waste tanks was declared an unreviewed safety question. The waste tank safety task team was established at that time to carry out safety evaluations and plan the means for mitigating this potential hazard. Action was promptly taken to identify those tanks with the highest hazard and to implement interim operating requirements to minimize ignition sources.

403 (WHC-SD-WM-PAP–60) **TWRS corrosion monitoring program plan.** Lindsay, D.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Oct 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002368. Source: OSTI; NTIS; INIS; GPO Dep.

This plan is for the compilation of existing relevant corrosion data, the generation of current corrosion data by monitoring present conditions in the Hanford waste tank systems, and the development of methods to control corrosion on the Hanford site.

404 (WHC-SD-WM-PE–053) **242-A Campaign 94-1 post run document.** Guthrie, M.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001631. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this post-run document is to summarize the results of 242-A Evaporator Campaign 94-1 as required. Campaign 94-1 represents the first Evaporator operation since 1989, following completion of the B-534 upgrades and Liquid Effluent Retention Facility (LERF) construction. The purpose of Campaign 94-1 was to concentrate dilute waste from TK-102-AW, TK-106-AW, and TK-103-AP. From an available 2.87 million gallon feedstock of dilute waste contained in 102-AW, 106-AW and 103-AP, an overall Waste Volume Reduction (WVR) of 2.39 million gallons (83% WVRF) was achieved. At the completion of the campaign, approximately 477,000 gallons of dilute double-shell slurry feed (DDSSF) was produced with a SpG. of 1.25–1.30. Total process condensate discharged to LERF was 3.09 million gallons, achieving a condensate/WVR ratio of 1.29. Throughput for Campaign 94-1 was 5.27 million gallons. Total steam condensate and cooling water discharge to B-pond was 4.7 and 216 million gallons respectively. The evaporator operated approximately 43 days of the 60 day campaign for a total operating efficiency of 73%. Campaign 94-1 was completed without any discharge limit, Operating Specification Document, or Operational Safety Requirement violations. Major problems encountered during the run included the following: (1) high CA1 deentrainment pad dP's caused by foaming, (2) condensate pump P-C100 failure, and (3) ion exchange column dP's and efficiency.

405 (WHC-SD-WM-PLN–090) **Low-level waste vitrification plant environmental permitting plan.** Gretsinger, W.T.; Colby, J.M. Westinghouse Hanford Co., Richland, WA (United States). 3 Oct 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002369. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents projected environmental permitting and approval requirements for the treatment and disposal of low-level Hanford tank waste by vitrification. Applicability, current status, and strategy are discussed for each potential environmental permit or approval.

406 (WHC-SD-WM-PMP–014) **LABCORE post release 1.0 development system project management plan.** Rich, H.S. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 37p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95001411. Source: OSTI; NTIS; INIS; GPO Dep.

The LABCORE post release 1.0 development system project management plan (SPMP) is the primary planning document governing the development of specific enhancements to the LABCORE project. The mission of the Westinghouse Hanford Company (WHC) laboratories is changing from supporting the 200 Area chemical processing plants for process control, waste management, and effluent monitoring to supporting environmental restoration and regulatory compliance commitments. The LABCORE program was implemented as the key element for meeting the commitments by upgrading the laboratories through the implementation of an Automated Data Processing improvement program in January 1994. Scope for LABCORE release 1.0 consisted of hardware and software implementation required to support a minimum number of analyses (Single-Shell Tank [SST] analysis at 222S Laboratory and Performance Evaluation samples at the Waste Sampling Characterization Facility laboratory) using manual entry of data, and to support routine laboratory functions, common to all laboratories. LABCORE post release 1.0 enhancements will expand the functionality presented to the laboratory. Post release 1.0 enhancements will also address the integration of a database for Analytical Services Program Integration, budgeting, and scheduling offices into LABCORE.

407 (WHC-SD-WM-QAPP-029) **Software quality assurance plan for viscometer.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 18 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002145. Source: OSTI; NTIS; INIS; GPO Dep.

The in situ viscometer is a portable instrument designed to raise and lower a sphere (rheometer ball) through layers of tank waste material while recording ball position, velocity, and cable tension. In the field, the viscometer attaches to a decontamination spool piece which in turn is designed to attach to any 4-inch, 150-pound flange (typical of many available tank risers). The motion of the ball and collection of data is controlled by instrumentation and control equipment housed in a separate remote control console. This document covers the product, Viscometer Data Acquisition Software. This document provides the software quality assurance plan, verification and validation plan, and configuration management plan for developing the software for the instrumentation that will be used to obtain rheology data from Tank SY-101.

408 (WHC-SD-WM-QAPP-030) **Software quality assurance plan for void fraction instrument.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 18 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002161. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Tank SY-101 has been the focus of extensive characterization work over the past few years. The waste continually generates gases, most notably hydrogen, which are periodically released from the waste. Gas can be trapped in tank waste in three forms: as void gas (bubbles), dissolved gas, or absorbed gas. Void fraction is the volume percentage of a given sample that is comprised of void gas. The void fraction instrument (VFI) acquires the data necessary to calculate void fraction. This document covers the product, Void Fraction Data Acquisition Software. The void fraction software being developed will have the ability to control the void fraction instrument hardware and acquire data necessary to calculate the void fraction in samples. This document provides the software quality assurance plan, verification and validation plan, and configuration management plan for developing the software for the instrumentation that will be used to obtain void fraction data from Tank SY-101

409 (WHC-SD-WM-RD-038-Rev.1) **Tank Waste Remediation System Projects Document Control Plan.** Slater, G.D.; Halverson, T.G. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001984. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Tank Waste Remediation System Projects Document Control Plan is to provide requirements and responsibilities for document control for the Hanford Waste Vitrification Plant (HWVP) Project and the Initial Pretreatment Module (IPM) Project.

410 (WHC-SD-WM-RPT-087) **Gamma irradiation test report of simulated grout specimens for gas generation/liquid advection.** Hinman, C.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002239. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results from an irradiation test performed on four specimens of grout that were fabricated from synthetic Double Shell Slurry Feed (DSSF) liquid waste. The objective was to investigate the radiolytic generation of gases and the potential for advective rejection of waste liquids from the grout matrix and to provide experimental information for the validation of the C-Cubed calculated model. It has been demonstrated that a number of gases can be formed within the grout due to radiolytic decomposition of various chemical components that make up the grout. This observation leads to the conjecture that the potential exists for the rejection of a portion of the 60 vol% free liquid from the grout matrix driven by pressurization by these gases. It was found that, for the specimen geometries used in this test series, and for peak radiation dose accumulation rates on the order of 4 to 60 times of the initial rate expected in the grout vaults (300 Rads/hr), no liquid rejection was observed from 2% to 35% of the target exposure expected in the grout vaults (1E+08 Rads). When the irradiation rate exceeded the projected grout vault dose rate by a factor of 200 a small amount of liquid rejection was observed from one of two specimens that had received 20% more than the goal exposure. Because of the differences in the magnitudes of the relative radiation field strengths between this study and an actual grout vault, it is concluded that the potential for liquid rejection by internal gas pressurization from presently configured grout waste forms is very low for the expected conditions.

411 (WHC-SD-WM-SD-019) **A summary description of the flammable gas tank safety program.** Johnson, G.D.; Sherwood, D.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002077. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive liquid waste may produce hydrogen as result of the interaction of gamma radiation and water. If the waste contains organic chelating agents, additional hydrogen as well as nitrous oxide and ammonia may be produced by thermal and radiolytic decomposition of these organics. Several high-level radioactive liquid waste storage tanks, located underground at the Hanford Site in Washington State, are on a Flammable Gas Watch List. Some contain waste that produces and retains gases until large quantities of gas are released rapidly to the tank vapor space. Tanks nearly-filled to capacity have relatively little vapor space; therefore if the waste suddenly releases a large amount of hydrogen and nitrous oxide, a flammable gas mixture could result. The most notable example of a Hanford waste tank with a flammable gas problem is tank 241-SY-101. Upon occasion waste stored in this tank has released enough flammable gas to burn if an ignition source had been present inside of the tank. Several, other Hanford waste tanks exhibit similar behavior although to a lesser magnitude. Because this behavior was hot adequately-addressed in safety analysis reports for the Hanford Tank Farms, an unreviewed safety question was declared, and in 1990 the Flammable Gas Tank Safety Program was established to address this problem. The purposes of the program are a follows: (1) Provide safety documents to fill gaps in the safety analysis reports, and (2) Resolve the safety issue by acquiring knowledge about gas retention and release from radioactive liquid waste and developing mitigation technology. This document provides the general logic and work activities required to resolve the unreviewed safety question and the safety issue of flammable gas mixtures in radioactive liquid waste storage tanks.

412 (WHC-SD-WM-SDD-025) **Anti-foam System design description.** White, M.A. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 19p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001636. Source: OSTI; NTIS; INIS; GPO Dep.

The Anti-foam System is a sub-system of the 242-A Evaporator facility. The Anti-foam is used within the C-A-1 Vapor-Liquid Separator, to reduce the effect of foaming and reduce fluid bumping while the vapor and liquid are separated within the C-A-1 Vapor-Liquid Separator. Excessive foaming within the vessel may possibly cause the liquid slurry mixture in the evaporator vessel to foul the de-entrainment pads and cause plant shutdown. The Anti-foam System consists of the following primary elements: the Anti-foam Tank and the Metering Pump. The upgrades to Anti-foam System include the following: installation of a new pump, instruments, and valves; and connection of the instruments, pump and agitator associated with the Anti-foam System to the Monitoring and Control System (MCS). The 242-A Evaporator is a waste treatment facility designed to reduce liquid waste volumes currently stored in the Hanford Area double shell Waste Storage Tanks. The evaporator uses evaporative concentration to achieve this volume reduction, returning the concentrated slurry to the double-shell tanks for storage and, at the same time, releasing the process effluent to a retention facilities for eventual treatment and release to the environment.

413 (WHC-SD-WM-TA–158) **Conceptual design analyses for Hanford Site deployable remote spectroscopy systems.** Philipp, B.L.; Reich, F.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002078. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies potential remote, NIR spectroscopic waste surface moisture monitoring system design alternatives to be operated inside one of the Hanford Site, high level, nuclear waste storage tanks. Potential tank waste moisture data impacts from the remote NIR signal transfer through high humidity vapor space is evaluated.

414 (WHC-SD-WM-TI–399-Rev.2) **616 Nonradioactive Dangerous Waste Storage Facility – Essential/support drawing list: Revision 2.** Busching, K.R. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001404. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the essential and supporting engineering drawings for the 616 Nonradioactive Dangerous Waste Storage Facility. The purpose of the documents is to describe the criteria used to identify and the plan for updating and maintaining their accuracy. Drawings are designated as essential if they relate to safety systems, environmental monitoring systems, effluents, and facility HVAC, electrical, and plumbing systems. Support drawings are those which are frequently used or describe a greater level of detail for equipment, components, or systems shown on essential drawings. A listing of drawings identified as essential or support is provided in Table A.

415 (WHC-SD-WM-TI–607) **Radiological implications of contact maintenance: Impacts on facility design.** Brown, R.C. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 10 Mar 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE94018151. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide an initial, rough order of magnitude, evaluation of the relationship between the concentrations of selected radionuclides in process streams of a chemical process plant and the required degree of protective features for plant operations personnel. The evaluation provided in this document specifies "trigger level" concentrations of ^{90}Sr, ^{137}Cs, and transuranics (TRU) for "contact maintenance" activities. Concentrations above the "trigger levels" can be accommodated provided offsetting design features are incorporated (e.g., improved shielding partial to total confinement, etc.). This information will assist in defining the degree of reduction of concentrations of radionuclides required for the feed used in a low-level liquid waste processing plant to utilize a contact maintenance design concept. Offsetting design features that influence maintenance personnel exposures in a contact maintenance situation are identified. All concentrations are expressed in terms of actual process fluids before any flushing and decontamination steps.

416 (WHC-SD-WM-TI–643) **Significant volume reduction of tank waste by selective crystallization: 1994 Annual report.** Herting, D.L.; Lunsford, T.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001408. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this technology task plan is to develop and demonstrate a scaleable process of reclaim sodium nitrate ($NaNO_3$) from Hanford waste tanks as a clean nonradioactive salt. The purpose of the so-called Clean Salt Process is to reduce the volume of low level waste glass by as much as 70%. During the reporting period of October 1, 1993, through May 31, 1994, progress was made on four fronts – laboratory studies, surrogate waste compositions, contracting for university research, and flowsheet development and modeling. In the laboratory, experiments with simulated waste were done to explore the effects of crystallization parameters on the size and crystal habit of product $NaNO_3$ crystals. Data were obtained to allows prediction of decontamination factor as a function of solid/liquid separation parameters. Experiments with actual waste from tank 101-SY were done to determine the extent of contaminant occlusions in $NaNO_3$ crystals. In preparation for defining surrogate waste compositions, single shell tanks were categorized according to the weight percent $NaNO_3$ in each tank. A detailed process flowsheet and computer model were created using the ASPENPlus steady state process simulator. This is the same program being used by the Tank Waste Remediation System (TWRS) program for their waste pretreatment and disposal projections. Therefore, evaluations can be made of the effect of the Clean Salt Process on the low level waste volume and composition resulting from the TWRS baseline flowsheet. Calculations, using the same assumptions as used for the TWRS baseline where applicable indicate that the number of low level glass vaults would be reduced from 44 to 16 if the Clean Salt Process were incorporated into the baseline flowsheet.

417 (WHC-SD-WM-TI–645) **Statistical characterization report for Single-Shell Tank 241-T-107.** Cromar, R.D.; Wilmarth, S.R.; Jensen, L. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002090. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results of the statistical analysis of data from three core samples obtained from single-shell tank 241-T-107 (T-107). Four specific topics are addressed. They are summarized below. Section 3.0 contains mean concentration estimates of analytes found in T-107. The estimates of "error" associated with the concentration estimates are given as 95% confidence intervals (CI) on the mean. The results given are based on three types of samples: core composite samples, core segment samples, and drainable liquid samples. Section 4.0 contains estimates of the spatial variability (variability between cores and between segments) and the analytical variability (variability between the primary and the duplicate analysis). Statistical tests were performed to test the hypothesis that the between cores and the between segments spatial variability is zero. The results of the tests are as follows. Based on the core composite data, the between cores variance is significantly different from zero for 35 out of 74 analytes; i.e., for 53% of the analytes there is no statistically significant difference between the concentration means for two cores. Based on core segment data, the between segments variance is significantly different from zero for 22 out of 24 analytes and the between cores variance is significantly different from zero for 4 out of 24 analytes; i.e., for 8% of the analytes there is no statistically significant difference between segment means and for 83% of the analytes there is no difference between the means from the three cores. Section 5.0 contains the results of the application of multiple comparison methods to the core composite data, the core segment data, and the drainable liquid data. Section 6.0 contains the results of a statistical test conducted to determine the 222-S Analytical Laboratory's ability to homogenize solid core segments.

418 (WHC-SD-WM-TI–648) **Tank characterization reference guide.** De Lorenzo, D.S. (Los Alamos Technical Associates,

Kennewick, WA (United States)); DiCenso, A.T.; Hiller, D.B.; Johnson, K.W.; Rutherford, J.H.; Smith, D.J.; Simpson, B.C. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Kennewick, WA (United States). Sep 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001638. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of the Hanford Site high-level waste storage tanks supports safety issue resolution; operations and maintenance requirements; and retrieval, pretreatment, vitrification, and disposal technology development. Technical, historical, and programmatic information about the waste tanks is often scattered among many sources, if it is documented at all. This Tank Characterization Reference Guide, therefore, serves as a common location for much of the generic tank information that is otherwise contained in many documents. The report is intended to be an introduction to the issues and history surrounding the generation, storage, and management of the liquid process wastes, and a presentation of the sampling, analysis, and modeling activities that support the current waste characterization. This report should provide a basis upon which those unfamiliar with the Hanford Site tank farms can start their research.

419 (WHC-SD-WM-TI–661) **Waste behavior analysis for tank 241-SY-103.** Wilkins, N.E. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002084. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-SY-103 is on the Flammable Gas Watch List. The waste in this tank behaves similarly to that in tank 241-Sy-101. Both show slurry growth and periodic surface level drops. However, the surface level drops are much smaller than those in tank 101-SY. A standard hydrogen monitoring system (SHMS) was recently installed in tank 103-SY, and waste auger samples were recently taken. This document covers the characterization results to date for the auger samples, and the behavior of the tank waste during both steady state periods and gas release events.

420 (WHC-SD-WM-TI–664) **Evaluation of FTIR-based analytical methods for the analysis of simulated wastes.** Rebagay, T.V.; Cash, R.J.; Dodd, D.A.; Lockrem, L.L.; Meacham, J.E.; Winkelman, W.D. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001377. Source: OSTI; NTIS; INIS; GPO Dep.

Three FTIR-based analytical methods that have potential to characterize simulated waste tank materials have been evaluated. These include: (1) fiber optics, (2) modular transfer optic using light guides equipped with non-contact sampling peripherals, and (3) photoacoustic spectroscopy. Pertinent instrumentation and experimental procedures for each method are described. The results show that the near-infrared (NIR) region of the infrared spectrum is the region of choice for the measurement of moisture in waste simulants. Differentiation of the NIR spectrum, as a preprocessing steps, will improve the analytical result. Preliminary data indicate that prominent combination bands of water and the first overtone band of the ferrocyanide stretching vibration may be utilized to measure water and ferrocyanide species simultaneously. Both near-infrared and mid-infrared spectra must be collected, however, to measure ferrocyanide species unambiguously and accurately. For ease of sample handling and the potential for field or waste tank deployment, the FTIR-Fiber Optic method is preferred over the other two methods. Modular transfer optic using light guides and photoacoustic spectroscopy may be used as backup systems and for the validation of the fiber optic data.

421 (WHC-SD-WM-TP–207) **Tank 241-C-103 tank characterization plan.** Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Kennewick, WA (United States). 6 Oct 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002080. Source: OSTI; NTIS; INIS; GPO Dep.

The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling analytical needs for the resolution of safety issues. A Tank Characterization Plant (TCP) will be developed for each double shell tank (DST) and single-shell tank (SST) using the DQO process. There are four Watch list tank classifications (ferrocyanide, organic salts, hydrogen/flammable gas, and high heat load). These classifications cover the six safety issues related to public and worker health that have been associated with the Hanford Site underground storage tanks. These safety issues are as follows: ferrocyanide, flammable gas, organic, criticality, high heat, and vapor safety issues. Tank C-103 is one of the twenty tanks currently on the Organic Salts Watch List. This TCP will identify characterization objectives pertaining to sample collection, hot cell sample isolation, and laboratory analytical evaluation and reporting requirements in accordance with the appropriate DQO documents. In addition, the current contents and status of the tank are projected from historical information. The relevant safety issues that are of concern for tanks on the Organic Salts Watch List are: the potential for an exothermic reaction occurring from the flammable mixture of organic materials and nitrate/nitrite salts that could result in a release of radioactive material and the possibility that other safety issues may exist for the tank.

422 (WHC-SD-WM-TRP–220) **Core sample truck improvement test report.** Cockrell, A.B. Westinghouse Hanford Co., Richland, WA (United States). 14 Oct 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002367. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the bit testing results done under test plan WHC-SD-WM-TP-236. The conclusions and recommendations state the drill bit that gives the best overall results and will be used in the field for push mode sampling.

423 (WHC-SD-WM-WP–072-Rev.3) **Engineering drawing field verification program: Revision 3.** Ulk, P.F. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002097. Source: OSTI; NTIS; INIS; GPO Dep.

Safe, efficient operation of waste tank farm facilities is dependent in part upon the availability of accurate, up-to-date plant drawings. Accurate plant drawings are also required in support of facility upgrades and future engineering remediation projects. This supporting document establishes the procedure for performing a visual field verification of engineering drawings, the degree of visual observation being performed and documenting the results. A copy of the drawing attesting to the degree of visual observation will be paginated into the released Engineering Change Notice (ECN) documenting the field verification for future retrieval and reference. All waste tank farm essential and support drawings within the scope of this program will be converted from manual to computer aided drafting (CAD) drawings. A permanent reference to the field verification status will be placed along the right border of the CAD-converted drawing, referencing the revision level, at which the visual verification was performed and documented.

424 (WHC-SD-WM-WP–132-Rev.4) **Tank farm instrumentation and data acquisition/management upgrade plan.** Scaief, C.C. III. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 28p. DOE Contract AC06-87RL10930. Order Number DE95001515. Source: OSTI; NTIS; INIS; GPO Dep.

This plan provides the strategy, implementation, and schedule for upgrading tank farm instrumentation, data acquisition and data management. The focus is on surveillance parameters to verify and maintain tank safety. The criteria do not necessarily constitute mandatory requirements but are based upon engineering judgement and best available information. Schedules reflect preliminary funding for FY95. For out years they are best engineering judgment.

425 (WHC-SD-WM-WP–245-Rev.1) **B Plant low level waste system integrity assessment plan.** Walter, E.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-87RL10930. Order Number DE95002143. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a plan for the design evaluation, corrosion assessment, visual examination and leak test of the B Plant Low Level Waste Tank System. The results of these activities will be used to assess the compliance of this low level waste system to the Washington State Department of Ecology requirements.

426 (WHC-SD-WM-WP–264) **Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1).** McClees, J.; Truitt, R.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002074. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this effort is to transfer operating and maintenance responsibility for the 241-SY-101 data acquisition and control system (DACS-1) from Los Alamos National Laboratory to Westinghouse Hanford Company. This work plan defines the tasks required for a successful turnover. It identifies DACS-1 transition, deliverables, responsible organizations and individuals, interfaces, cost, and schedule. The transition plan will discuss all required hardware, software, documentation, maintenance, operations, and training for use at Hanford Waste Tank 241-SY-101. The transfer of responsibilities for DACS-1 to WHC is contingent on final approval of applicable Acceptance for Beneficial Use documentation by Waste Tank Operations. The DACS-1 was designed to provide data monitoring, display, and storage for Tank 241-SY-101. The DACS-1 also provides alarm and control of all the hydrogen mitigation testing systems, as well as ancillary systems and equipment (HVAC, UPS, etc.) required to achieve safe and reliable operation of the testing systems in the tank.

427 (WHC-SP–1009-Rev.1) **Waste sampling and characterization facility (WSCF).** Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001985. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Sampling and Characterization Facility (WSCF) complex consists of the main structure (WSCF) and four support structures located in the 600 Area of the Hanford site east of the 200 West area and south of the Hanford Meterology Station. WSCF is to be used for low level sample analysis, less than 2 mRem. The Laboratory features state-of-the-art analytical and low level radiological counting equipment for gaseous, soil, and liquid sample analysis. In particular, this facility is to be used to perform Resource Conservation and Recovery Act (RCRA) of 1976 and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 sample analysis in accordance with U.S. Environmental Protection Agency Protocols, room air and stack monitoring sample analysis, waste water treatment process support, and contractor laboratory quality assurance checks. The samples to be analyzed contain very low concentrations of radioisotopes. The main reason that WSCF is considered a Nuclear Facility is due to the storage of samples at the facility. This maintenance Implementation Plan has been developed for maintenace functions associate with the WSCF.

428 (WHC-SP–1097) **Liquid effluent/Hanford Environmental compliance FY 1995 Multi-Year Program Plan/Fiscal Year Work Plan, WBS 1.2.2.1 and 1.2.2.2.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 274p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001844. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the program effort to eliminate the use of the soil column for liquid effluent treatment and to manage current and future liquid effluent streams at the Hanford Site, in a safe responsible cost effective and legally compliant mannger. This should be achieved through planning, public and stakeholder interaction, definition of requiremtns for generators, and provision of timely treatment, stroage, disposal capability, and waste minimization of waste streams.

429 (WHC-SP–1142) **Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste.** Lipinski, R.M. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002968. Source: OSTI; NTIS; INIS; GPO Dep.

All transuranic (TRU) waste generators are required by US Department of Energy Order 5820.2A to package their TRU waste to comply with the Waste Acceptance Criteria (WAC) for the Waste Isolation Pilot Plant (WIPP). The Westinghouse Hanford Company (WHC) Transuranic Waste Certification Plan was developed to ensure that TRU newly waste generated at WHC meets the WIPP-WAC and/or. The methods used at WHC to package TRU waste are described in sufficient detail to meet WIPP certification or the regulations. This document is organized to provide a brief overview of waste generation operations at WHC, along with details on data management for TRU waste. The methods used to implement this plan are discussed briefly along with the responsibilities and authorities of applicable organizations. This certification plan describes how WHC complies with all applicable regulations and requirements set forth in the latest approved revision of WIPP-DOE-069.

430 (WSRC-RP–92-376) **Tritium pumps which once contained mercury meet the RCRA definition of "empty container".** Westinghouse Savannah River Co., Aiken, SC (United States). 15 Jul 1993. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002684. Source: OSTI; NTIS; GPO Dep.

This paper documents the Savannah River Site (SRS) position that tritium pumps that once contained mercury meet the Resource Conservation and Recovery Act (RCRA) definition of "empty container". As discussed in Section 2.0 of this paper, the existing regulations and supporting EPA guidance and documentation support this position. Section 3.0 describes how the pump's physical nature and the manner in which it is used is consistent with those regulations and guidance.

431 (WSRC-TR–93-762) **Selection of melter systems for the DOE/Industrial Center for Waste Vitrification Research.** Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). 31 Dec 1993. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001476. Source: OSTI; NTIS; INIS; GPO Dep.

The EPA has designated vitrification as the best developed available technology for immobilization of High-Level Nuclear Waste. In a recent federal facilities compliance agreement between the EPA, the State of Washington, and the DOE, the DOE agreed to vitrify all of the Low Level Radioactive Waste resulting from processing of High Level Radioactive Waste stored at the Hanford Site. This is expected to result in the requirement of 100 ton per day Low Level Radioactive Waste melters. Thus, there is increased need for the rapid adaptation of commercial melter equipment to DOE's needs. DOE has needed a facility where commercial pilot scale equipment could be operated on surrogate (non-radioactive) simulations of typical DOE waste streams. The DOE/Industry Center for Vitrification Research (Center) was established in 1992 at the Clemson University Department of Environmental Systems Engineering, Clemson, SC, to address that need. This report discusses some of the characteristics of the melter types selected for installation of the Center. An overall objective of the Center has been to provide the broadest possible treatment capability with the minimum number of melter units. Thus, units have been sought which have broad potential application, and which had construction characteristics which would allow their adaptation to various waste compositions, and various operating conditions, including extreme variations in throughput, and widely differing radiological control requirements. The report discusses waste types suitable for vitrification; technical requirements for the application of vitrification to low level mixed wastes; available melters and systems; and selection of melter systems. An annotated bibliography is included.

432 (WSRC-TR–94-0243) **H-area Acid/Caustic Basin groundwater monitoring report: First quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1994. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002826. Source: OSTI; NTIS; GPO Dep.

During first quarter 1994, samples collected from the four HAC monitoring wells at the H-Area Acid/Caustic Basin received comprehensive analyses (exclusive of boron and lithium) and turbidity measurements. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS) or the Savannah River Site (SRS) flagging criteria or turbidity standard during the quarter are the focus of this report. Tritium exceeded the final PDWS in all four HAC wells during first quarter 1994. Carbon tetrachloride and heptachlor epoxide exceeded the final PDWS in well HAC 4. Aluminum exceeded its Flag 2 criterion in wells HAC 2, 3, and 4. Iron was elevated in wells HAC 1 and 2. Manganese exceeded its Flag 2 criterion in well HAC 3. Total organic halogens was elevated in wells HAC 2 and 3. No well samples exceeded the SRS turbidity standard.

433 (WSRC-TR–94-0244) **K-Area acid/caustic basin groundwater monitoring report: First quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1994. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002827. Source: OSTI; NTIS; GPO Dep.

During first quarter 1994, samples from the KAC monitoring wells at the K-Area Acid/Caustic Basin were collected and analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclides, and other constituents. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS), other Savannah River Site (SRS) Flag 2 criteria, or the SRS turbidity standard are provided in this report. No constituents exceeded the final PDWS in the KAC wells. Aluminum, iron, total organic halogens, and turbidity exceeded other SRS flagging criteria in one or more of the downgradient wells. The upgradient KAC wells contained no elevated constituents.

434 (WSRC-TR–94-0245) **P-Area Acid/Caustic Basin groundwater monitoring report: First quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002828. Source: OSTI; NTIS; GPO Dep.

During first quarter 1994, samples from the six PAC monitoring wells at the P-Area Acid/Caustic Basin were collected and analyzed for indicator parameters, groundwater quality parameters, parameters characterizing suitability as a drinking water supply, and other constituents. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS) or the Savannah River Site (SRS) flagging criteria or turbidity standard during the quarter are discussed in this report. During first quarter 1994, no constituents exceeded the final PDWS. Aluminum exceeded its SRS Flag 2 criterion in all six PAC wells. Iron exceeded its Flag 2 criterion in four wells, while manganese exceeded its Flag 2 criterion in three wells.

435 (WSRC-TR–94-0290) **High level waste characterization in support of low level waste certification: I. HLW supernate radionuclide characterization.** Jamison, M.E.; d'Entremont, P.D.; Clemmons, J.S.; Bess, C.E.; Brown, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). 8 Jul 1994. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002829. Source: OSTI; NTIS; INIS; GPO Dep.

High Level Waste Programs has radioactive waste storage, treatment and processing facilities that are located in the F and H Areas at the Savannah River Site. These facilities include the Effluent Treatment Facility (ETF), F and H Area Tank Farms, Extended Sludge Processing (ESP), and In-Tank Precipitation (ITP). Job wastes are generated from operation, maintenance, and construction activities inside radiological areas. These items may have been contaminated with radioactive supernate, salt, and sludge material. Most of these wastes will be disposed of in the E-area Vaults. Therefore, an isotopic and hazardous characterization must be performed. The characterization of HLW supernate radionuclides is discussed in Chapter I. The characterization for salt and sludge phases, which can also contaminate LLW, will be included in other Chapters.

436 (WSRC-TR–94-0296) **Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification.** Clemons, J.S. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Jun 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001465. Source: OSTI; NTIS; INIS; GPO Dep.

The 1S Manual requires that High Level Waste (HLW) implement a waste certification program prior to sending waste packages to the E-Area vaults. To support the waste certification plan, the HLW supernate inventory of uranium, plutonium, neptunium and americium have been characterized. This characterization is based on the chemical, isotopic and radiological properties of these elements in HLW supernate. This report uses process knowledge, solubility data, isotopic inventory data and sample data to determine if any isotopes of the aforementioned elements will exceed the minimum reportable quantity (MRQ) for waste packages contaminated with HLW supernate. If the MRQ can be exceeded for a particular nuclide, then a method for estimating the waste package content is provided. Waste packages contaminated from HLW supernate do not contain sufficient U-233, U-234, U-235, U-236, U-238, Pu-239, Pu-240, Pu-241, Pu-242 or Am-241 to warrant separate reporting on the shipping manifest. Calculations show that, on average, more than 100 gallons of supernate is required to exceed the PAC (package acceptance criteria) for each of these nuclides. Thus it is highly unlikely that the PAC would be exceeded for these nuclides and unlikely that the MRQ would be exceeded. These nuclides should be manifested as zero for waste packages contaminated with HLW supernate. The only actinide isotopes that may exceed the MRQ are Np-237 and Pu-238. The recommended method to calculate the amount of these two isotopes in waste packages contaminated with HLW supernate is to ratio them to the measured Cs-137 activity.

437 (WSRC-TR–94-0297) **Characterization of hazardous constituents in HLW supernate and implications for solid LLW generation.** Georgeton, G.K. Westinghouse Savannah River Co., Aiken, SC (United States). 22 Jun 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002818. Source: OSTI; NTIS; INIS; GPO Dep.

High Level Waste supernates are hazardous due to the presence of small quantities of mercury, chromium, lead, silver and barium. The fate of these components based on process knowledge was evaluated. The supernates were grouped into Traditional (normal storage and evaporation), Dilute (stored in Type IV tanks), and Sludge Processing categories, and a review of the limited quantity of available sample data for each type of supernate was performed. The maximum concentration of each hazardous constituent was determined. The most restrictive hazardous constituent in Traditional and Sludge Processing supernates was determined to be mercury, and the most restrictive component in Dilute supernate was chromium. Containers of solid waste contaminated with these supernates must be manifested as nonhazardous before disposal as Low Level Waste in the engineered vaults in the EAV. A method was developed to screen waste containers in order to identify those containers that are nonhazardous. A criterion for ^{137}Cs content was arbitrarily set to 0.1 Ci, and the volume of supernate required to deposit 0.1 Ci was calculated. Containers with less than 0.1 Ci of ^{137}Cs and over 85 lb of solid waste contaminated with supernate from normal storage and evaporation operations are nonhazardous. Containers with less than 0.1 Ci of ^{137}Cs and over 170 lb of solid waste contaminated with supernate from sludge processing operations are nonhazardous. All containers of waste contaminated with supernate from Type IV tanks were evaluated as being nonhazardous. The screening method is readily applicable in the field - if the ^{137}Cs content of a container is below 0.1 Ci and the weight of the waste is greater than 85 or 170 lb (depending on waste type), the waste container is nonhazardous. Containers not satisfying both criteria will be segregated for additional evaluation.

438 (WSRC-TR–94-0305) **High level waste tank farm solid waste radionuclide smear sample and analysis plan.** Gray, P.L. Westinghouse Savannah River Co., Aiken, SC (United States). 13 Jul 1994. 35p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC09-89SR18035. Order Number DE95002819. Source: OSTI; NTIS; INIS; GPO Dep.

The HLW Tank Farm Low-Level Solid Waste Radionuclide Smear Sample And Analysis Plan has been written to describe the three methods by which the HLW Tank Farm facilities will obtain analytical data of radionuclide distribution in, and activities of, solid waste generated in the Tank Farms for waste certification and delivery to the Low Activity Waste Vaults (LAWV) in E Area. Results will be used as a possible confirmatory supplement to process knowledge as contained in the document, WSRC-TR-94-0290, "High-Level Waste Characterization In Support Of Low-Level Waste Certification, I. HLW Supernate Radionuclide Characterization." The purpose of collecting samples is to obtain analytical data to supplement the validation data from WSRC-TR-94-0290 that gives radionuclide distributions for low-level job control waste characterization. It is expected that the results received from the laboratory will not enable quantification within the existing WAC limits but will be used only to possibly supplement the validation of years of determinations made based on process knowledge and sampling the High Level Waste (HLW). This occurs because several of the nuclides in the WAC 3.10 list are either expected to be present in such low abundance and/or have such a soft radiation (e.g., low energy beta) that even the most sensitive laboratory techniques cannot detect their presence and measure their abundance.

439 (WSRC-TR–94-0346) **H-Area, K-Area, and Par Pond Sewage Sludge Application Sites groundwater monitoring report: Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002697. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater samples from the three wells at the H-Area Sewage Sludge Application Site (HSS wells) are analyzed quarterly for constituents as required by South Carolina Department of Health and Environmental Control (SCDHEC) Construction Permit 12,076. Samples from the three wells at the K-Area Sewage Sludge Application Site (KSS wells) and the three wells at the Par Pond Sewage Sludge Application Site (PSS wells) are analyzed quarterly for constituents required by SCDHEC Construction Permit 13,173. All samples are also analyzed as requested for other constituents as part of the Savannah River Site (SRS) Groundwater Monitoring Program. Annual analyses for other constituents, primarily metals, also are required by the permits. No constituents exceeded the SCDHEC final Primary Drinking Water Standard in any well from the H-Area, K-Area, and Par Pond Sewage Sludge Application Sites. Aluminum, iron, lead, and manganese, which were above standards and Flag 2 criteria in one or more wells in the three sites during first quarter 1994, were not analyzed this quarter. Second quarter results are similar to results for fourth quarter 1993.

440 (WSRC-TR–94-0347) **F-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002698. Source: OSTI; NTIS; INIS; GPO Dep.

During second quarter 1994, samples from the FAC monitoring wells at the F-Area Acid/Caustic Basin were collected and analyzed for herbicides/pesticides, indicator parameters, metals, nitrate, radionuclide indicators, volatile organic compounds, and other constituents. Piezometer FAC 5P and monitoring well FAC 6 were dry and could not be sampled. Analytical results that exceeded final Primary Drinking Water Standards (PDWS), other Savannah River Site (SRS) Flag 2 criteria, or the SRS turbidity standard of 50 NTU during the quarter were as follows: gross alpha exceeded the final PDWS and aluminum, iron, manganese, and total organic halogens exceeded the SRS Flag 2 criteria in one or more of the FAC wells. Turbidity exceeded the SRS standard in well FAC 3. Groundwater flow direction and rate in the water table beneath the F-Area Acid/Caustic Basin were similar to past quarters.

441 (WSRC-TR–94-0348) **H-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002696. Source: OSTI; NTIS; INIS; GPO Dep.

During second quarter 1994, samples collected from the four HAC monitoring wells at the H-Area Acid/Caustic Basin received comprehensive analyses (exclusive of boron and lithium) and turbidity measurements. Monitoring results that exceeded the final Primary Drinking Water Standards (PDWS) or the Savannah River Site (SRS) flagging criteria or turbidity standard during the quarter are the focus of this report. Tritium exceeded the final PDWS in all four HAC wells during second quarter 1994. Carbon tetrachloride exceeded the final PDWS in well HAC 4. Aluminum exceeded its Flag 2 criterion in wells HAC 2, 3, and 4. Iron was elevated in wells HAC 1, 2, and 3. Manganese exceeded its Flag 2 criterion in well HAC 3. Specific conductance and total organic halogens were elevated in well HAC 2. No well samples exceeded the SRS turbidity standard. Groundwater flow direction in the water stable beneath the H-Area Acid/Caustic Basin was to the west during second quarter 1994. During previous quarters, the groundwater flow direction has been consistently to the northwest or the north-northwest. This apparent change in flow direction may be attributed to the lack of water elevations for wells HTF 16 and 17 and the anomalous water elevations for well HAC 2 during second quarter.

442 (WSRC-TR–94-0385) **Preliminary site characterization - final report.** Clark, D.; Smith, L.B. Westinghouse Savannah River Co., Aiken, SC (United States). Dec 1993. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002686. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the ecological unit reconnaissance conducted at the F-Area Burning/Rubble Pit(s) RCRA/CERCLA Unit (F-Area BRP) on August 30 and 31, 1993 as part of the RFI/RI baseline risk assessment for the waste unit The baseline risk assessment will assess the potential endangerment to human health and the environment associated with the unit and will be used to evaluate remediation criteria, if needed. The information presented in this report will be used in subsequent stages of the ecological risk assessment to refine the conceptual site model, assist in the selection of contaminants of concern, identify potential ecological receptors, and evaluate trophic relationships and other exposure pathways. The unit reconnaissance survey was conducted in accordance with Specification No. E-18272, Rev. 1 dated August 5, 1993, and the Draft "Ecological Risk Assessment Program Plan for Evaluation of Waste Sites on the Savannah River Site". The objectives of the site reconnaissance were to: Assess the general characteristics of on-unit biological communities including mammals, birds, reptiles, amphibians, and any aquatic communities present. Determine the location, extent, and characteristics of on-unit ecological resources, such as forested areas and wetlands, that could serve as important wildlife habitat or provide other ecological functions. Identify any overt effects of contamination on biological communities. The field investigations included mapping and describing all wetland and terrestrial habitats; recording wildlife observations of birds, mammals, and reptiles; and investigating ecological resources in nearby downgradient and downstream areas which could be affected by mobile contaminants or future remedial actions. In preparation for the field investigation, existing unit information including aerial photographs and reports were reviewed to help identify and describe ecological resources at the waste unit.

443 (WSRC-TR–94-0387) **Wastewaters at SRS where heavy metals are a potential problem.** Wilde, E.W.; Radway, J.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002685. Source: OSTI; NTIS; INIS; GPO Dep.

The principal objective of this report is to identify and prioritize heavy metal-containing wastewaters at the Savannah River Site (SRS) in terms of their suitability for testing of and clean-up by a novel bioremediation process being developed by SRTC. This process involves the use of algal biomass for sequestering heavy metal and radionuclides from wastewaters. Two categories of SRS wastewaters were considered for this investigation: (1) waste sites (primarily non-contained wastes managed by Environmental

Restoration), and (2) waste streams (primarily contained wastes managed by Waste Management). An attempt was made to evaluate all sources of both categories of waste throughout the site so that rational decisions could be made with regard to selecting the most appropriate wastewaters for present study and potential future treatment. The investigation included a review of information on surface and/or groundwater associated with all known SRS waste sites, as well as waters associated with all known SRS waste streams. Following the initial review, wastewaters known or suspected to contain potentially problematic concentrations of one or more of the toxic metals were given further consideration.

444 (Y/ER–158) **Closure certification report for the Bear Creek burial grounds B area and walk-in pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge Y-12 Plant, TN (United States). Jun 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95001769. Source: OSTI; NTIS; INIS; GPO Dep.

On July 5, 1993, the revised RCRA Closure Plan for the Bear Creek Burial Grounds B Area and Walk-In Pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, DOE/OR/01-1100&D3 and Y/ER-53&D3, was approved by the Tennessee Department of Environment and Conservation (TDEC). The closure activities described in that closure plan have been performed. The purpose of this document is to summarize the closure activities for B Area and Walk-In Pits (WIPs), including placement of the Kerr Hollow Quarry debris at the WIPs.

445 (Y/TS–806/R3) **Resource Conservation and Recovery Act (RCRA) Part B permit application for container storage units at the Oak Ridge Y-12 Plant.** Oak Ridge National Lab., TN (United States). Aug 1994. 311p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95002063. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains Part B of the Permit Application for Container Storage Units at the Oak Ridge Y-12 Plant. Sections cover the following areas: Facility description; Waste characteristics; Process information; Ground water monitoring; Procedures to prevent hazards; Contingency plan; Personnel training; Closure plan, post closure plan, and financial requirements; Recordkeeping; Other federal laws; Organic air emissions; Solid waste management units; and Certification.

446 (Y/TS–838/R3) **Resource Conservation and Recovery Act (RCRA) Part B Permit Application for Production Associated Units at the Oak Ridge Y-12 Plant.** Oak Ridge Y-12 Plant, TN (United States). Sep 1994. 277p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95002065. Source: OSTI; NTIS; INIS; GPO Dep.

This is the RCRA required permit application for Radioactive and Hazardous Waste Management at the Oak Ridge Y-12 Plant for the following units: Building 9206 Container Storage Unit; Building 9212 Container Storage Unit; Building 9720-12 Container Storage Unit; Cyanide Treatment Unit. All four of these units are associated with the recovery of enriched uranium and other metals from wastes generated during the processing of nuclear materials.

0530 Environmental Aspects

Refer also to citation(s) 149, 230, 231, 235, 241, 249, 251, 259, 271, 324, 433, 495, 497, 499, 1843, 1849, 1859

447 (BNWL-SA–3045) **Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968.** Becker, C.D. (Pacific Northwest Labs., Richland, WA (United States). Aquatic Ecology Section); Coutant, C.C. Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab. 24 Sep 1969. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001345. Source: OSTI; NTIS; GPO Dep.

Young chinook salmon held in live boxes were drifted through Hanford reactor discharges in the central Columbia River, with the objective of evaluating the affect of heated effluents on fish survival. No significant mortalities of fish were recorded from 12 drifts during the spring (March–April) when base river temperatures were low, ranging from 4 to 7.6 C. Some mortalities occurred, however, in 3 of 24 drifts conducted in late summer (August–September) when base river temperatures extended from 17 to 19.6 C. None of the mortalities resulted from passage through midstream discharge plumes, which were characterized by relatively moderate temperature increase and short duration of exposure to maximum temperatures. Mortalities occurred only when fish were drifted along the south bank of the river through areas receiving heated water via intragravel seepage from shoreline retention basins and experimental subsurface disposal of reactor effluents. The shoreline areas were characterized by impeded river flow, which restricted horizontal and vertical mixing and prolonged the exposure of drifted fish to excessively warm temperatures. The extent of thermal shock sufficient to cause death in the field is primarily an integrated function of temperature increase and exposure duration, as has been demonstrated in laboratory experiments. The numerous possible combinations of these two factors that occur in situ have only been partially explored.

448 (BNWL-SA–3583) **Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features.** Becker, C.D. (Pacific Northwest Labs., Richland, WA (United States). Ecosystems Dept.). Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab. 1 Aug 1970. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001333. Source: OSTI; NTIS; GPO Dep.

The relationship of thermal discharges from operating Hanford reactors to food and feeding of juvenile chinook salmon (Oncorhynchus tshawytscha) in the central Columbia River, Washington was studied in 1968 and 1969. The primary objectives were to (1) evaluate the food composition and feeding activities of the fish and (2) determine if heated effluents influenced their welfare. Environmental conditions (seasonal changes in river temperatures and flow volumes) in relation to thermal requirements of young chinook are detailed. Data on food organisms utilized by the fish in 1968 and 1969 are presented, whereas analyses for possible thermal effects are based on the more extensive 1969 data. No consistent differences attributable to thermal increments were evident. The lack of detectable effects apparently results from the fact that the main discharge plumes occur in midriver and the effluents are well mixed before reaching inshore feeding areas. The transient nature of fish at each sampling site and the availability of food organisms in the river drift are ecological factors affecting critical thermal evaluation.

449 (DOE/EA–0820) **Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment.** Oak Ridge National Lab., TN (United States). Apr 1994. 18p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001759. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy has prepared an environmental assessment, DOE/EA-0820, to assess the potential environmental impacts of constructing and operating two mixed waste Resource Conservation and Recovery Act (RCRA) storage facilities. The new facilities would be located inside and immediately west of the security-fenced area of the Oak Ridge National Laboratory Hazardous Waste Management Area in Melton Valley, Tennessee. Based on the analyses in the environmental assessment, the Department has determined that the proposed action does not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act of 1969. Therefore, the preparation of an environmental impact statement is not required, and the Department is issuing this finding of no significant impact.

450 (DOE/EA–0879) **Neutron Generator/Switch Tube (NG/ST) prototyping relocation environmental assessment.** Department of Energy, Washington, DC (United States). Div. of Electric Energy Systems. Apr 1994. 16p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002678. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) has prepared an Environmental Assessment (DOE/EA-0879), for Neutron Generator/Switch Tube Prototyping Relocation at the Sandia National Laboratories, Albuquerque, New Mexico. The proposed action would involve moving

some existing activities or processes into currently vacant space, without alteration in processes or waste generation. Based on the analyses in the Environmental Assessment, DOE has determined that the action is not a major Federal action significantly affecting the quality of the human environment, within the meaning of the National Environmental Policy Act of 1969. Therefore, the preparation of an environmental impact statement is not required and the Department is issuing this Finding of No Significant Impact.

451 (DOE/ID–22110) **Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91.** Liszewski, M.J.; Mann, L.J. Geological Survey, Idaho Falls, ID (United States). 1993. 47p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). (USGS-OFR–93-126). Order Number DE95001915. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center Open-File Reports Section, Box 25425, Mail Stop 517, Denver Federal Center, Denver, CO 80225; GPO Dep.

Analytical data for 23 trace elements are reported for ground- and surface-water samples collected at and near the Idaho National Engineering Laboratory during 1988–91. Water samples were collected from 148 wells completed in the Snake River Plain aquifer, 18 wells completed in discontinuous deep perched-water zones, and 1 well completed in an alluvial aquifer. Surface-water samples also were collected from three streams, two springs, two ponds, and one lake. Data are categorized by concentrations of total recoverable of dissolved trace elements. Concentrations of total recoverable trace elements are reported for unfiltered water samples and include results for one or more of the following: aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, nickel, selenium, silver, and zinc. Concentrations of dissolved trace elements are reported for water samples filtered through a nominal 0.45-micron filter and may also include bromide, fluoride, lithium, molybdenum, strontium, thallium, and vanadium. Concentrations of dissolved hexavalent chromium also are reported for many samples. The water samples were analyzed at the US Geological Survey's National Water Quality Laboratory in Arvada, Colorado. Methods used to collect the water samples and quality assurance instituted for the sampling program are described. Concentrations of chromium equaled or exceeded the maximum contaminant level at 12 ground-water quality monitoring wells. Other trace elements did not exceed their respective maximum contaminant levels.

452 (DOE/LLW–212) **INEL storage facility for sealed sources from the commercial sector.** Kingsford, C.O.; Satterthwaite, B.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94064). Order Number DE95002044. Source: OSTI; NTIS; INIS; GPO Dep.

Commercially owned sealed radiation sources determine by the US Nuclear Regulatory Commission to be a public health or safety hazard are accepted by the US Department of Energy, under the Atomic Energy Act of 1954, as material for reuse of recycle. To implement this policy, the sealed sources must be stored until proper disposition is determined. This report documents the investigation and selection process undertaken to locate a suitable storage facility at the Idaho National Engineering Laboratory.

453 (DOE/NV/11432–123-Vol.2) **US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices.** Black, S.C.; Glines, W.M.; Townsend, Y.E. Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Sep 1994. 436p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95003022. Source: OSTI; NTIS; INIS; GPO Dep.

This report is comprised of appendices which support monitoring and surveillance on and around the Nevada Test Site (NTS) during 1993. Appendix A contains onsite Pu-238, gross beta, and gamma-emitting radionuclides in air. Appendix B contains onsite tritium in air. Appendix C contains onsite Pu-238, Sr-90, gross alpha and beta, gamma-emitting radionuclides, Ra-226, Ra-228 and tritium in water. A summary of 1993 results of offsite radiological monitoring is included in Appendix D. Appendix E contains radioactive noble gases in air onsite. Appendix F contains onsite thermoluminescent dosimeter data. Historical trends in onsite thermoluminescent dosimeter data are contained in Appendix G. Appendix H summarizes 1993 compliance at the DOE/NV NTS and non-NTS facilities. Appendix I summarizes the 1993 results of non radiological monitoring.

454 (DOE/OR/21865–1) **Streamflow, specific-conductance, and temperature data for Bayou and Little Bayou Creeks near Paducah, Kentucky, August 15 and 16, 1989.** Evaldi, R.D.; McClain, D.L. Geological Survey, Las Vegas, NV (United States). 1989. 19p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract AI05-89OR21865. (USGS-OFR–89-582). Order Number DE95001701. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Books and Open-File Reports, Box 25425, Federal Center, Denver, CO 80225; GPO Dep.

Discharge, temperature, and specific conductance measurements were made August 15 and 16, 1989, at 74 main channel sites and seven tributaries on Bayou and Little Bayou Creeks in the vicinity of the Paducah Gaseous Diffusion Plant. These measurements were made during base flow conditions to provide data for analysis of the interaction of surface and ground water. The discharge of Bayou Creek was 0.30 cubic feet per second (ft^3/s) at the most upstream site, and 5.8 ft^3/s at the most downstream site. Total measured tributary inflow of Bayou Greek was 5.7 ft^3/s. Specific conductance values in the Bayou Creek watershed ranged from 208 to 489 microsiemens per centimeter ($\mu S/cm$), and water temperature ranged from 20.0 to 32.6 degrees Celsius (°C). The discharge of Little Bayou Creek was 0.65 ft^3/s at the most upstream site, and 1.8 ft^3/s at the most downstream site. Total measured tributary inflow of Little Bayou Creek was 0.38 ft^3/s. Specific conductance values in the Little Bayou Creek watershed ranged from 211 to 272 $\mu S/cm$, and water temperature ranged from 14.5 to 24.9°C.

455 (DOE/RL–94-36-2) **Quarterly report of RCRA groundwater monitoring data for period April 1 through June 30, 1994.** USDOE Richland Field Office, WA (United States). Oct 1994. 446p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002950. Source: OSTI; NTIS; GPO Dep.

Hanford Site interim-status groundwater monitoring projects are conducted as either background, indicator parameter evaluation, or groundwater quality assessment monitoring programs as defined in the Resource Conservation and Recovery Act of 1976 (RCRA); and "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," as amended (40 Code of Federal Regulations [CFR] 265). Compliance with the 40 CFR 265 regulations is required by the Washington Administrative Code (WAC) 173-303. This report contains data from Hanford Site groundwater monitoring projects. Westinghouse Hanford Company manages RCRA groundwater monitoring projects for federal facilities on the Hanford Site. Project management, specifying data needs, performing quality control oversight, managing data, and preparing project sampling schedules are all parts of this responsibility. This quarterly report contains data received between May 20 and August 19, 1994, which are the cutoff dates for this reporting period. This report may contain not only data from the April through June quarter but also data from earlier sampling events that were not previously reported.

456 (EGG-PIR–10633(4Q-93)) **Performance Indicators for 4th quarter CY 1993.** Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001973. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) has established a Department-wide Performance Indicator (PI) Program for trending and analysis of operational data as directed by DOE Order 5480.26. The PI Program was established to provide a means for monitoring the environment, safety, and health (ES&H) performance of the DOE at the Secretary and other management levels. This is the twelfth in a series of quarterly reports generated for the Department of Energy Idaho Operations Office (DOE-ID) by EG&G Idaho, Inc., to meet the requirements of the PI Program as directed by the DOE

Standard (DOE-STD-1048-92). The report format and content adhere to the guidelines established in DOE Order 5480.26, Trending and Analysis of Operations Information Using Performance Indicators, and DOE-STD-1048-92, DOE Performance Indicators Guidance Document.

457 (ES/ER/TM--86/R1) **Toxicological benchmarks for wildlife: 1994 Revision.** Opresko, D.M.; Sample, B.E.; Suter, G.W. II. Oak Ridge National Lab., TN (United States). Sep 1994. 187p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002293. Source: OSTI; NTIS; INIS; GPO Dep.

The process by which ecological risks of environmental contaminants are evaluated is two-tiered. The first tier is a screening assessment where concentrations of contaminants in the environment are compared to toxicological benchmarks which represent concentrations of chemicals in environmental media (water, sediment, soil, food, etc.) that are presumed to be nonhazardous to the surrounding biota. The second tier is a baseline ecological risk assessment where toxicological benchmarks are one of several lines of evidence used to support or refute the presence of ecological effects. The report presents toxicological benchmarks for assessment of effects of 76 chemicals on 8 representative mammalian wildlife species and 31 chemicals on 9 avian wildlife species. The chemicals are some of those that occur at United States Department of Energy waste sites; the wildlife species were chosen because they are widely distributed and provide a representative range of body sizes and diets. Further descriptions of the chosen wildlife species and chemicals are provided in the report. The benchmarks presented in this report represent values believed to be nonhazardous for the listed wildlife species. These benchmarks only consider contaminant exposure through oral ingestion of contaminated media; exposure through inhalation or direct dermal exposure are not considered in this report.

458 (ESH-EMS--94-0514) **The Savannah River Site's groundwater monitoring program: First quarter 1994.** Rogers, C.D. (Exploration Resources, Inc., Athens, GA (United States)). Westinghouse Savannah River Co., Aiken, SC (United States); Exploration Resources, Inc., Athens, GA (United States). Jul 1994. 1046p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002835. Source: OSTI; NTIS; GPO Dep.

This report summarizes the SRS Groundwater Monitoring Program conducted by EPD/EMS during first quarter 1994. It includes the analytical data, field data, data review, quality control, and other documentation for this program; provides a record of the program's activities; and serves as an official document of the analytical results. EPD/EMS is responsible for monitoring constituents in the groundwater at approximately 135 waste sites in 16 areas at SRS. EPD/EMS is responsible for monitoring wells but is not responsible for the facilities where the wells are located. The Groundwater Monitoring Program includes the following activities: installation, maintenance, and abandonment of monitoring wells; environmental soil borings; development of sampling and analytical schedules; collection and analysis of groundwater samples; review of analytical and other data; maintenance of the databases containing groundwater monitoring data; quality assurance (QA) evaluations of laboratory performance; reports of results to waste-site facility custodians and the Environmental Protection Section (EPS) of EPD.

459 (LA-SUB--94-139) **Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico.** Los Alamos National Lab., NM (United States); Stephens (Daniel B.) and Associates, Inc., Albuquerque, NM (United States). 19 Nov 1993. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001749. Source: OSTI; NTIS; INIS; GPO Dep.

A numerical model, TOUGH2, was selected for describing liquid- and gas-phase flow in the unsaturated tuff underlying the TA-73 landfill. The model was selected primarily for its ability to simulate the significant mechanisms that may affect transport of contaminants through the vadose zone at the TA-73 landfill, including non-isothermal flow through fractured media. TOUGH2 is the best documented, verified, and validated model capable of performing the required simulations. The sensitivity analyses that were performed and describes in this report identified the input parameters that the selected numerical model is most sensitive to. The input parameters analyzed were saturated hydraulic conductivity, van Genuchten α and n, residual and saturated moisture contents, infiltration rate, fracture spacing and permeability, atmospheric pressure, and temperature. The sensitivity analyses were performed using a model grid that was designed to incorporate the regions in the landfill vicinity where contaminant transport is likely to occur and where the physical processes affecting flow and transport are the most dynamic. The sensitivity analyses performed suggest that the model is quite sensitive to a number of input parameters, including saturated hydraulic conductivity, the van Genuchten parameters α and n (for both the tuff matrix and fractures), fracture density and aperture, and atmospheric pressure. The results indicate that additional site-specific hydraulic properties and fracture data should be obtained before attempting to perform predictive, numerical simulations of gas- and liquid-phase flow beneath the landfill.

460 (NRFEM(EC)--740) **1993 environmental monitoring report for the naval reactors facility.** Bettis Atomic Power Lab., West Mifflin, PA (United States). [1994]. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. Order Number DE95002194. Source: OSTI; NTIS; INIS; GPO Dep.

The results of the radiological and nonradiological environmental monitoring programs for 1993 at the Naval Reactors Facility (NRF) are presented in this report. The results obtained from the environmental monitoring programs verify that releases to the environment from operations at NRF were in accordance with state and federal regulations. Evaluation of the environmental data confirms that the operation of NRF continues to have no adverse effect on the quality of the environment or the health and safety of the general public. Furthermore, a conservative assessment of radiation exposure to the general public as a result of NRF operations demonstrated that the dose received by any member of the public was well below the most restrictive dose limits prescribed by the Environmental Protection Agency (EPA) and the Department of Energy (DOE).

461 (ORNL/ER--26) **Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 472p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002290. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of 22 groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 5. WAG 5 is located south of the Oak Ridge National Laboratory main plant area in Melton Valley and includes 33 solid waste management units. The wells at WAG 5 were drilled and developed between July 1987 and March 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 5. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

462 (ORNL/ER--69) **Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Lee, T.A. Oak Ridge National Lab., TN (United States). Sep 1994. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002291. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of seven groundwater quality monitoring (GQM) wells on the perimeter of

Upper Waste Area Grouping (WAG) 2. Upper WAG 2 is composed of portions of White Oak Creek (WOC), Melton Branch, two of Melton Branch's tributaries, and the floodplains surrounding these water bodies. The WOC section of the subject site begins at the confluence of WOC and Melton Branch and extends 0.62 mile upstream to the 7,500 bridge. The Melton Branch portion of the site also begins at the confluence of WOC and Melton Branch and extends eastward 0.88 mile upstream. The wells at Upper WAG 2 were drilled and developed between December 1989 and October 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at Upper WAG-2. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

463 (ORNL/ER–72) **Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 273p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002307. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of nine groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 8 and two GQM wells on the perimeter of WAG 9. WAG 8 encompasses approximately 34 acres, most of which are located in Melton Valley. Irregular in shape, the site has two sinuous extensions from its northern end that contain the low-level radioactive waste (LLW) transfer lines. WAG 8 contains 22 solid waste management units (SWMUs) that can be divided into 4 groups. These groups include the High Flux Isotope Reactor/ Transuranium Processing Facility waste collection basins, the LLW line leak sites, and the active LLW tanks. WAG 9 encompasses about 3 acres and is located west of the main portion of WAG 8 and south of Melton Valley Drive. WAG 9 contains four SWMUs. The wells in WAGs 8 and 9 were drilled and developed from June 1989 to March 1990. Monitoring wells were installed to characterize and assess the WAGs in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAGs 8 and 9. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

464 (ORNL/ER–74) **Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Mortimore, J.A. (Oak Ridge National Lab., TN (United States)); Ebers, M.L. Oak Ridge National Lab., TN (United States). Sep 1994. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002292. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the drilling and installation of groundwater quality monitoring (GQM) wells on the perimeter of Waste Area Grouping (WAG) 17. WAG 17 is composed of approximately 23 acres and is located in Bethel Valley about 3,100 ft east of the Oak Ridge National Laboratory (ORNL) main plant area. The facilities in WAG 17 constitute the ORNL Services Area and include the shipping and receiving departments, machine shops, carpenter shops, paint shops, lead burning facilities, tritium facility, and the materials storage area. The wells at WAG 17 were drilled and developed between November 1989 and April 1990. These wells were installed to characterize and assess the WAG in accordance with applicable Department of Energy, state, and Environmental Protection Agency regulatory requirements. The purpose of the well installation program was to install GQM wells for groundwater characterization at WAG 17. Data packages produced during installation activities by the ERCE hydrogeologists are an important product of the program. These packages document the well drilling, installation, and development activities and provide valuable data for well sampling and WAG 17 characterization. The forms contained in the packages include predrilling and postdrilling checklists, drilling and construction logs, development and hydraulic conductivity records, and quality control-related documents.

465 (ORNL/ER–201) **Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Aug 1994. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002305. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan addresses the monitoring, sampling, and analysis activities that will be conducted at seeps and springs and at two french drain outlets in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-land-burial disposal facility for low-level radioactive waste at Oak Ridge National Laboratory, a research facility owned by the US Department of Energy and operated by Martin Marietta Energy Systems, Inc. Initially, sampling will be conducted at as many as 15 locations within WAG 6 (as many as 13 seeps and 2 french drain outlets). After evaluating the results obtained and reviewing the observations made by field personnel during the first round of sampling, several seeps and springs will be chosen as permanent monitoring points, together with the two french drain outlets. Baseline sampling of these points will then be conducted quarterly for 1 year (i.e., four rounds of sampling after the initial round). The samples will be analyzed for various geochemical, organic, inorganic, and radiological parameters. Permanent sampling points having suitable flow rates and conditions may be outfitted with automatic flow-monitoring equipment. The results of the sampling and flow-monitoring efforts will help to quantify flux moving across the ungauged perimeter of the site and will help to identify changes in releases from the contaminant sources.

466 (PNL–10082) **Hanford Site ground-water monitoring for 1993.** Dresel, P.E. (and others); Luttrell, S.P.; Evans, J.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 278p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002318. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Ground-Water Surveillance Project monitoring for calendar year 1993 on the Hanford Site, Washington. Hanford Site operations from 1943 onward produced large quantities of radiological and chemical waste that have impacted ground-water quality on the Site. Monitoring of water levels and ground-water chemistry is performed to track the extent of contamination and trends in contaminant concentrations. The 1993 monitoring was also designed to identify emerging ground-water quality problems. The information obtained is used to verify compliance with applicable environmental regulations and to evaluate remedial actions. Data from other monitoring and characterization programs were incorporated to provide an integrated assessment of Site ground-water quality. Additional characterization of the Site's geologic setting and hydrology was performed to support the interpretation of contaminant distributions. Numerical modeling of sitewide ground-water flow also supported the overall project goals. Water-level monitoring was performed to evaluate ground-water flow directions, to track changes in water levels, and to relate such changes to changes in site disposal practices. Water levels over most of the Hanford Site continued to decline between June 1992 and June 1993. The greatest declines occurred in the 200-West Area. These declines are part of the continued response to the cessation of discharge to U Pond and other disposal facilities. The

low permeability in this area which enhanced mounding of wastewater discharge has also slowed the response to the reduction of disposal. Water levels remained nearly constant in the vicinity of B Pond, as a result of continued disposal to the pond. Water levels measured from wells in the unconfined aquifer north and east of the Columbia River indicate that the primary source of recharge is irrigation practices.

467 (SAND–94-2339C) **Stiffness and strength properties of natural fractures from north ramp drill holes.** Olsson, W.A.; Price, R.H.; Brown, S.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409238–2: Workshop on rock mechanics, Rockville, MD (United States), 19-20 Sep 1994). Order Number DE95001882. Source: OSTI; NTIS; INIS; GPO Dep.

Cores containing natural fractures were obtained from drillholes UE 25 NRG-4 and USW NRG-6 at Yucca Mountain, Nevada. Seven selected fractures were sheared at constant normal stress, either 5 or 10 MPa, in the air-dry condition. Detailed profilometer data were collected from each fracture surface before testing. The tests yielded the normal closure as a function of normal stress, and the shear stress and dilation as a function of shear offset. The constitutive properties resulting from the measurements were: normal stiffness, shear stiffness, shear strength and coefficient of friction, and dilation. Peak friction ranged from 0.89 to 1.11; residual friction ranged from 0.76 to 1.00. The lowest initial dilation angle was found to be 5.29° and the highest was 11.28°. The roughness characteristics of the fracture surfaces agree qualitatively with the simple mathematical model of Brown (1994) derived from fracture data in many other rock types.

468 (WAPD-RC/E(EE)–3300) **1993 Effluent and environmental monitoring report for the Bettis Atomic Power Laboratory, Pittsburgh Site.** Bettis Atomic Power Lab., West Mifflin, PA (United States). [1993]. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC11-93PN38195. Order Number DE95001438. Source: OSTI; NTIS; INIS; GPO Dep.

The results of the radiological and non-radiological environmental monitoring programs for 1993 at the Bettis-Pittsburgh Site are presented. The results obtained from the monitoring programs demonstrate that the existing procedures ensured that environmental releases during 1993 were in accordance with applicable Federal and State regulations. Evaluation of the environmental data indicates that the current operations at the Site continue to have no adverse effect on the quality of the environment. A conservative assessment of radiation exposure to the general public as a result of Site operations demonstrated that the dose received by any member of the public was well below the most restrictive dose limits established by the US Environmental Protection Agency and the US Department of Energy.

469 (WHC-MR–0418) **Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site.** Johnson, A.R.; Markes, B.M.; Schmidt, J.W.; Shah, A.N.; Weiss, S.G.; Wilson, K.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001986. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes and reports a literature search of 85 environmental monitoring records of wildlife and vegetation (biota) at the 200 East Area and the 200 West Area of the Hanford Site since 1965. These records were published annually and provided the majority of the data in this report. Additional sources of data have included records of specific facilities, such as site characterization documents and preoperational environmental surveys. These documents have been released for public use. Records before 1965 were still being researched and therefore not included in this document. The intent of compiling these data into a single source was to identify past and current concentrations of radionuclides in biota at specific facilities and waste sites within each operable unit that may be used to help guide cleanup activities in the 200 Areas to be completed under the Comprehensive Environmental Response and Liability Act (CERCLA). The 200 East Area and 200 West Area were the locations of the Hanford Site separation and process facilities and waste management units. For the purposes of this document, a sample was of interest if a Geiger-Mueller counter equipped with a pancake probe-indicated beta/gamma emitting radioactivity above 200 counts per minute (cpm), or if laboratory radioanalyses indicated a radionuclide concentration equaled or exceeded 10 picocuries per gram (pCi/g). About 4,500 individual cases of monitoring for radionuclide uptake or transport in biota in the 200 Areas environs were included in the documents reviewed. About 1,900 (i.e., 42%) of these biota had radionuclide concentrations in excess of 10 pCi/g. These radionuclide transport or uptake cases were distributed among 45 species of wildlife (primarily small mammals and feces) and 30 species of vegetation. The wildlife species most commonly associated with radioactive contamination were the house mouse and the deer mouse and of vegetation species, the Russian thistle.

470 (WHC-SD-SNF-ES–001) **KE Basin water dispositioning engineering study.** Hunacek, G.S.; Gahir, S.S. Westinghouse Hanford Co., Richland, WA (United States). 23 Sep 1994. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001035. Source: OSTI; NTIS; INIS; GPO Dep.

This engineering study is a feasibility study of KE Basin water treatment to an acceptable level and dispositioning the treated water to Columbia River, ground through ETF or to air through evaporation.

471 (WHC-SD-SNF-LB–001) **Radon discrimination for work place air samples.** Bratvold, T. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001649. Source: OSTI; NTIS; INIS; GPO Dep.

Gross alpha/beta measurement systems are designed solely to identify an incident particle as either an alpha or a beta and register a count accordingly. The tool of choice for radon identification, via decay daughters, is an instrument capable of identifying the energy of incident alpha particles and storing that information separately from detected alpha emissions of different energy. In simpler terms, the desired instrument is an alpha spectroscopy system. K Basins Radiological Control (KBRC) procured an EG&G ORTEC OCTETE PC alpha spectroscopy system to facilitate radon identification on work place air samples. The alpha spectrometer allows for the identification of any alpha emitting isotope based on characteristic alpha emission energies. With this new capability, KBRC will explicitly know whether or not there exists a true airborne concern. Based on historical air quality data, this new information venue will reduce the use of respirators substantially. Situations where an area remains "on mask" due solely to the presence of radon daughters on the grab air filter will finally be eliminated. This document serves to introduce a new method for radon daughter detection at the 183KE Health Physics Analytical Laboratory (HPAL). A new work place air sampling analysis program will be described throughout this paper. There is no new technology being introduced, nor any unproven analytical process. The program defined over the expanse of this document simply explains how K Basins Radiological Control will employ their alpha spectrometer.

472 (WHC-SD-WM-RPT–093) **Research of documents pertaining to waste migration from leaking single-shell tanks.** Consort, S.D. (ICF Kaiser Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). 30 Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001378. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the results from an investigation of the literature concerning single-shell tank (SST) leaks on the Hanford Site. The purpose of the investigation is to determine if available data confirm or refute the assertion that leaked waste from the SSTs has reached ground water. There are 67 leaking single-shell tanks (SSTs) on the Hanford Site. Although the maximum volume of leaked waste is approximately 4,013,000 L (1,060,000 gal), it is not the only waste in the ground beneath the 200 Area. Before 1966, supernatant solution was intentionally discharged from the cascading SSTs to the ground. Other leaks from piping and surface spills contributed to the waste in the ground. The maximum estimated

volume of unintentionally leaked waste from the tanks is less than 1% of the intentionally released liquid waste that was sent to the cribs and trenches from the SSTs. The volume does not include the liquid waste sent intentionally from other facilities directly to the cribs, trenches, and injection wells. The components and concentrations of the intentionally released waste were in compliance with applicable standards at the time of release.

473 (WSRC–3Q1-2-Vol.1-Rev.3) **Savannah River Site Environmental Monitoring Plan: Volume 1, Section 1000 Addendum: Revision 3.** Jannik, G.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001246. Source: OSTI; NTIS; INIS; GPO Dep.

This document – the Savannah River Site Environmental Monitoring Plan (SRS EM Plan) – has been prepared according to guidance contained in the DOE 5400 Series orders, in 10 CFR 834, and in DOE/EH-0173T, Environmental Regulatory Guide for Radiological Effluent Monitoring and environmental Surveillance [DOE, 1991]. The SRS EM Plan's purpose is to define the criteria, regulations, and guideline requirements with which SRS will comply. These criteria and requirements are applicable to environmental monitoring activities performed in support of the SRS Environmental Monitoring Program (SRS EM Program), WSRC-3Q1-2, Volume 1, Section 1100. They are not applicable to monitoring activities utilized exclusively for process monitoring/control. The environmental monitoring program requirements documented in the SRS EM Plan incorporate all applicable should requirements of DOE/EH-0173T and expand upon them to include nonradiological environmental monitoring program requirements.

474 (WSRC-RP–93-67-4-Vol.2) **M-Area Hazardous Waste Management Facility groundwater monitoring report – Fourth quarter 1993 and 1993 summary: Volume 2.** Evans, C.S.; Washburn, F.; Jordan, J.; Van Pelt, R. Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1994. 1048p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001144. Source: OSTI; NTIS; GPO Dep.

This report consists of appendices containing data in support of groundwater monitoring efforts performed at M-Area Hazardous Waste Management Facility at the Savannah River Site. The data focus on the following: standards; flagging criteria; water elevation and isoconcentration contour maps; key to monitoring results tables; data quality/usability assessment; time series plots, which shows concentrations of trichloroethylene; hydrographs; CUSUM data; and errata and revisions.

475 (WSRC-TR–94-0246) **Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994.** Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1994. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001466. Source: OSTI; NTIS; GPO Dep.

During first quarter 1994, samples from AMB groundwater monitoring wells at the Metallurgical Laboratory Hazardous Waste Management Facility (HWMF) were analyzed for selected heavy metals, indicator parameters, radionuclides, volatile organic compounds, and other constituents. Nine parameters exceeded standards during the quarter. As in previous quarters, tetrachloroethylne and trichloroethylene exceeded final Primary Drinking Water Standards (PDWS); in addition, gross alpha and lead exceeded final PDWS during first quarter 1994. Aluminum, iron, manganese, pH, and total organic halogens exceeded the Savannah River Site (SRS) Flag 2 criteria in one or more of the wells. Groundwater flow direction and rate in the water-table unit were similar to previous quarters.

476 (WSRC-TR–94-0351) **Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994.** Chase, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 311p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002664. Source: OSTI; NTIS; INIS; GPO Dep.

During second quarter 1994, samples from AMB groundwater monitoring wells at the Metallurgical Laboratory Hazardous Waste Management Facility were analyzed for selected heavy metals, indicator parameters, radionuclides, volatile organic compounds, and other constituents. Three parameters exceeded standards during the quarter. As in previous quarters, tetrachloroethylene and trichloroethylene exceeded final Primary Drinking Water Standards. Total organic halogens exceeded the Savannah River Site (SRS) Flag 2 criteria in two of the wells. Groundwater flow direction and rate in the M-Area Aquifer Zone were similar to previous quarters. Conditions affecting determination of groundwater flow directions and rates in the Upper Lost Lake Aquifer Zone, Lower Lost Lake Aquifer Zone, and the Middle Sand Aquifer Zone of the Crouch Branch Confining Unit were also similar to previous quarters. During second quarter 1994, SRS received SCDHEC approval for five point-of-compliance wells and two plume definition wells near the Met Lab HWMF. Field work has begun on this project.

477 (WSRC-TR–94-0425) **Hydrologic budget for A/M Area, Savannah River Site.** Hiergesell, R.A.; Haselow, J.S.; Jackson, D.G.; Ehrke, L. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001473. Source: OSTI; NTIS; INIS; GPO Dep.

In this investigation different components of the hydrologic budget for the groundwater flow system beneath the A/M Area were quantified. To accomplish this a regional groundwater flow mode, previously calibrated to the groundwater flow system beneath the A/M Area, was used to generate flux terms which could then be used to quantify specific components of the hydrologic budget. Sub-zones within the constructed model were defined in terms of groups of model nodes using the US Geological Survey code ZONEBUDGET. Cell-by-cell flux terms generated by the groundwater model for each node were used as input to calculate the hydrologic budgets for each of the defined sub-zones. Results were tabulated both as actual groundwater fluxes and as normalized quantities to allow easy comparison of flux magnitudes for different sub-zones. In the process of defining sub-zones and calculating the flux magnitude for different components of the hydrologic flow system, the adequacy of the groundwater flow model in describing the actual flow system was better determined. In effect, quantification of flux terms from the groundwater model functioned as a "calibration tool" in that specific changes to the groundwater model which would enhance its calibration were identified and are described in this report.

478 (Y/SUB–94-99069C/Y15/9) **Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1.** Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Jul 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95001689. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to present potentiometric, groundwater quality and vapor monitoring data required for comprehensive monitoring of underground storage tank (UST) 2331-U at the Building 9201-1 Site. Comprehensive monitoring has been conducted at the site as part of a Monitoring Only program approved by the Tennessee Department of Environment and Conservation (TDEC) based on review and approval of Site Ranking (Site Ranking Form approved May 23, 1994). Site Status Monitoring will be conducted semiannually. Groundwater samples were analyzed for total petroleum hydrocarbons for gasoline range organics, and for benzene, toluene, ethylbenzene, and xylenes. This document is organized into three sections. Section 1 presents introductory information relative to the site including the regulatory initiative and a site description. Section 2 includes the results of sampling of monitoring wells GW-193, GW-657, GW-707, GW-708, GW-808, GW-809, and GW-810. Section 3 presents data from vapor monitoring conducted in subsurface utilities present at the site. Groundwater samples were analyzed for total petroleum hydrocarbons for gasoline range organics, and for benzene, toluene, ethylbenzene, and xylenes.

0540 Health and Safety

Refer also to citation(s) 223, 224, 225, 226, 228, 229, 233, 235, 239, 243, 246, 301, 306, 309, 310, 311, 325, 326, 328, 329, 346, 351, 353, 365, 373, 376, 377, 378, 379, 381, 384, 401, 409, 411, 415, 419, 421, 426, 428, 440, 453, 456, 460, 469, 579, 742, 874, 940, 975, 976, 1165, 1433, 1496, 1787, 1790, 1795, 1796, 1910, 1918, 1969, 2453

479 (CONF-9308217–, pp. 5, Paper 1) **The Uranium Mill Tailings Remedial Action Project.** Chernoff, A. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This provides an outline description of the history, development, and administration of the Uranium Mill Tailing Remedial Action Project. EPA standards for clean-up, programatic approach, site specific planning, and cost and schedule are some of the topics covered.

480 (CONF-9308217–, pp. 9, Paper 10) **Groundwater restoration of uranium ISL mines in the United States.** Catchpole, G.; Kuchelka, R. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

Although the in-situ leach (ISL) mining of uranium in the US started in the 1960's, the real expansion of this form of mining, which is also called solution mining, took place in the early to mid 1970's in Texas. Some of the early test work used an acid lixiviant but it was soon recognized that, because of environmental considerations, the use of alkaline lixiviants would be preferable to the regulatory agencies and the public. In the past, the two types of alkaline based lixiviants used at US ISL mines were ammonia bicarbonate and sodium bicarbonate. A few ISL mines get by with just adding carbon dioxide to the well field solution. Ammonia bicarbonate is no longer being used today in the US because of the difficulties and expense of restoring the water quality to acceptable standards following mining. This paper briefly describes ISL mining principles and then details procedures and techniques used at USA ISL uranium mines to restore water quality in the mined aquifer. The basic elements are fairly constant but there can be considerable variation in type of water treatment equipment, methods of waste water disposal and use of chemical reducing agents. Three case histories are also presented.

481 (CONF-9308217–, pp. 12, Paper 3) **The UMTRA Project process and framework for execution.** Bosiljevac, F. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This take presents an outline of remedial action for uranium mill tailings. The following topics are included: Uranium Mill Tailings Remedial Action Project; the NEPA process; remedial action plans and processes.

482 (CONF-9308217–, pp. 15, Paper 11) **Tailings remediation at UMTRA Project Sites: Engineering practices.** Lommler, J.C. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This paper covers the engineering aspects of mill tailing remediation at Uranium Mill sites. Topics covered include: design considerations including types of radiation, barrier layers, erosion protection, hydrology, slope stability, earthquakes, verification of parameters during construction. Examples are given.

483 (CONF-9308217–, pp. 17, Paper 9) **The Uranium Mill Tailings Radiation Control Act and its implementation from a regulatory perspective.** Gillen, D.M. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This summarizes the interactions between the Uranium Mill Tailing Radiation Control Act and regulatory support of the NRC. Topics covered include: the law; the standards; NRC's role; UMTRA Project review process; NRC guidance; regulatory observations/experience.

484 (CONF-9308217–, pp. 18, Paper 15) **Quality assurance, documentation, and long-term monitoring.** Edge, R. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This presentation covers the regulatory framework for the Uranium Mill tailing remedial action project: UMTRCA, EPA (health and environmental standards; proposed ground water restoration standards), NRC (licensing), custody and long-term care requirement.

485 (CONF-9308217–, pp. 23, Paper 12) **Groundwater remediation at UMTRA Sites.** Metzler, D. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This presentation discusses the second phase of the Uranium Mill Tailing Remedial Action Project - ground water remediation. Topics covered include: NEPA regulations; Conditions addressed; requirements for ground water clean-up; US DOE input in terms of the planning process and quantifying the potential health and Environment Risks; relationship between risk assessment and safety standards; long and short term purpose of risk assessments; length of project; verification monitoring; documentation.

486 (CONF-9308217–, pp. 24, Paper 7) **Analysis of population and workers exposure in the context of decommissioning of Wismut uranium mining operations and clean up of wastes.** Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This presents an overview analysis of exposure to radioactive materials during remedial action on Wismut (Germany) uranium mines. Topics covered include: aim of analysing existing situation; analysis basis of existing radiological situation;analysis of population and workers exposure by planned operations;radioactive materials handling licence; environmental assessment; specific exposure situation; sources of radiological exposure from leftovers of

former Wismut mining operations; water and air pathways of exposure; internal exposure.

487 (DOE/AL/62350–113) **Response to the independent technical review of the UMTRA Project procedures and practices for well drilling and development.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018460. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a response to the findings and recommendations contained in the ITR report. The text of this document summarizes each ITR finding and recommendation, presents the TAC response, and concludes that implementation of many of the recommendations would benefit the UMTRA Project. Implementation of the recommendations represents ongoing improvement to the TAC well installation and development procedures and will result, in lower overall project costs. Appendix B is an implementation plan that groups similar or complementary action items, provides a schedule for implementation, identifies the group or people responsible for the changes, and estimates hours to implement the changes. The four major action items are as follows: (1) ITR Reevaluation, (2) Well Installation SOP Review and Revision, (3) Well Installation Contract Review and Revision, and (4) TAC and DOE Communications Improvement. The hours listed to implement the improvements are intended to be estimates for budgeting and planning purposes for the remainder of this fiscal year and the upcoming fiscal year.

488 (DOE/AL/62350–120) **Baseline risk assessment of ground water contamination at the inactive uraniferous lignite ashing site near Belfield, North Dakota.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018464. Source: OSTI; NTIS; INIS; GPO Dep.

This Baseline Risk Assessment of Ground Water Contamination at the Inactive Uraniferous Lignite Ashing Site Near Belfield, North Dakota, evaluates potential impacts to public health or the environment resulting from ground water contamination at the site where coal containing uranium was burned to produce uranium. The US Department of Energy's Uranium Mill Tailings Remedial Action (UMTRA) Project is evaluating plans to remedy soil and ground water contamination at the site. Phase I of the UMTRA Project consists of determining the extent of soil contamination. Phase II of the UMTRA Project consists of evaluating ground water contamination. Under Phase II, results of this risk assessment will help determine what remedial actions may be necessary for contaminated ground water at the site. This risk assessment evaluates the potential risks to human health and the environment resulting from exposure to contaminated ground water as it relates to historic processing activities at the site. Potential risk is quantified for constituents introduced from the processing activities, and not for those constituents naturally occurring in water quality in the site vicinity. Background ground water quality has the potential to cause adverse health effects from exposure through drinking. Any risks associated with contaminants attributable to site activities are incremental to these risks from background ground water quality. This incremental risk from site-related contaminants is quantified in this risk assessment. The baseline risk from background water quality is incorporated only into the assessment of potential chemical interactions and the definition of the overall site condition.

489 (DOE/AL/62350–135) **UMTRA Project water sampling and analysis plan, Belfield and Bowman, North Dakota.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018471. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action is scheduled to begin at the Belfield and Bowman Uranium Mill Tailings Remedial Action (UMTRA) Project sites in the spring of 1996. Water sampling was conducted in 1993 at both the Belfield processing site and the Bowman processing/disposal site. Results of the sampling at both sites indicate that ground water conditions have remained relatively stable over time. Water sampling activities are not scheduled for 1994 because ground water conditions at the two sites are relatively stable, the 1993 sampling was comprehensive, and surface remediation activities are not scheduled to start until 1996. The next water sampling event is scheduled before the start of remedial activities and will include sampling selected monitor wells at both sites and several domestic wells in the vicinity.

490 (DOE/AL/62350–138) **Work plan for ground water elevation data recorder/monitor well injection at Grand Junction, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 18 Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018462. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Grand Junction, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between the shallow aquifer and the Colorado River. Data collection objectives (DCO) identify reasons for collecting data. The following are DCOs for the Grand Junction ground water elevation data recorder/monitor well installation project: long-term continuous ground water level data and periodic ground water samples will be collected to better understand the relationship between surface and ground water at the site; water level and water quality data will eventually be used in future ground water modeling to more firmly establish boundary conditions in the vicinity of the Grand Junction processing site; modeling results will be used to demonstrate and document the potential remedial alternative of natural flushing.

491 (DOE/AL/62350–139) **Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). 18 Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018463. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Gunnison, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between ground water and surface water in the area. Data collection objectives (DCO) identify reasons for collecting data. The following are DCOs for the Gunnison ground water elevation data recorder/monitor well installation project: long-term continuous ground water level data and periodic ground water samples will be collected to better understand the relationship between surface and ground water at the site; water level and water quality data will eventually be used in future ground water modeling to more firmly establish boundary conditions in the vicinity of the Gunnison processing site; and modeling results will be used to demonstrate and document the potential remedial alternative of natural flushing.

492 (DOE/AL/62350–139-Rev.1) **Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado: Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE94018475. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water monitor wells and ground water elevation data recorders (data loggers) at the Gunnison, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site. The monitor wells and data loggers will be used to gather required time-dependent data to investigate the interaction between ground water and surface water in the area. Data collection objectives (DCO) identify reasons for collecting data. The following are DCOs for the Gunnison ground water elevation data recorder/monitor well installation project: long-term continuous ground water level data and periodic

ground water samples will be collected to better understand the relationship between surface and ground water at the site; water level and water quality data will eventually be used in future ground water modeling to more firmly establish numerical model boundary conditions in the vicinity of the Gunnison processing site; and modeling results will be used to demonstrate and document the potential remedial alternative of natural flushing.

493 (DOE/ID/13042–38) **Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL.** Monks, J.I. Idaho State Univ., Pocatello, ID (United States). 23 Sep 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-91ID13042. Order Number DE95001650. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the monitor wells that penetrate the upper portion of the Snake River Plain aquifer at the Idaho National Engineering Laboratory (INEL) are open over large intervals that include multiple water-bearing zones. Most of these wells are equipped with dedicated submersible pumps. Water of varying quality from different water-bearing zones is mixed within the wells. The hydrologic properties of individual water bearing zones are difficult to determine. Water quality and water-level data on organic, heavy metal, and radioactive contaminants have been collected, reported, and interpreted from these monitor wells for more than forty years. The problems associated with well completions over large intervals through multiple water-bearing zones raise significant questions about the data. A straddle-packer system was developed and applied at the INEL site to investigate the monitor well network. The straddle-packer system, hydraulic testing methods, data analysis procedures, and testing results are described in this report. The straddle-packer system and the straddle-packer testing and data evaluation procedures can be improved for future testing at the INEL site. Recommended improvements to the straddle-packer system are: (1) improved transducer pressure sensing systems, (2) faster opening riser valve, and (3) an in-line flowmeter in the riser pipe. Testing and data evaluation recommended improvements are: (1) simultaneous valve opening during slug tests, (2) analysis of the ratio of the times for head change and recovery to occur, (3) constant-drawdown tests of high transmissivity intervals, (4) multiple-well aquifer tests, and (5) long term head monitoring.

494 (DOE/OR–01-1268/V2-D1) **Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Aug 1994. 772p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER–172/V2-D1). Order Number DE95001698. Source: OSTI; NTIS; INIS; GPO Dep.

This report comprises appendices A–J which support the Y-12 Plant's remedial action report involving Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch). The appendices cover the following: Sampling fish from McCoy Branch; well and piezometer logs; ecological effects of contaminants in McCoy Branch 1989-1990; heavy metal bioaccumulation data; microbes in polluted sediments; and baseline human health risk assessment data.

495 (DOE/OR–01-1273/V2-D1) **Remedial investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendixes.** Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Aug 1994. 597p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER–182/V2-D1). Order Number DE95002067. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the appendices to the Remedial Investigation Report on Bear Creek Valley Operable Unit 2 (Rust Spoil Area, Spoil Area 1, and SY-200 Yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee. The appendices include Current and historical soil boring and groundwater monitoring well information, well construction logs, and field change orders; Analytical data; Human health risk assessment data; and Data quality.

496 (EGG-NRE–10754) **Criticality safety evaluation for TRU waste in storage at the RWMC.** Shaw, M.E.; Briggs, J.B.; Atkinson, C.A.; Briscoe, G.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1993. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002277. Source: OSTI; NTIS; INIS; GPO Dep.

Stored containers (drums, boxes, and bins) of transuranic waste at the Radioactive Waste Management Complex (RWMC) facility located at the Idaho National Engineering Laboratory (INEL) were evaluated based on inherent neutron absorption characteristics of the waste materials. It was demonstrated that these properties are sufficient to preclude an accidental criticality accident at the actual fissile levels present in the waste stored at the RWMC. Based on the database information available, the results reported herein confirm that the waste drums, boxes, and bins currently stored at the RWMC will remain safely subcritical if rearranged, restacked, or otherwise handled. Acceptance criteria for receiving future drum shipments were established based on fully infinite systems.

497 (EGG-PIR–10633(2Q-94)) **Performance indicators for 2nd quarter CY 1994.** Idaho National Engineering Lab., Idaho Falls, ID (United States). [1994]. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001908. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) has established a Department-wide Performance Indicator (PI) Program for trending and analysis of operational data as directed by DOE Order 5480.26. The PI Program was established to provide a means for monitoring the environment, safety, and health (ES&H) performance of the DOE at the Secretary and other management levels. This is the fourteenth in a series of quarterly reports generated for the Department of Energy Idaho Operations Office (DOE-ID) by EG&G Idaho, Inc., to meet the requirements of the PI Program as directed by the DOE Standard (DOE-STD-1048-92). The report format and content adhere to the guidelines established in DOE Order 5480.26, Trending and Analysis of Operations Information Using Performance Indicators, and DOE-STD-1048-92, DOE Performance Indicators Guidance Document.

498 (EGG-WTD–11156) **Buried waste integrated demonstration FY 94 deployment plan.** Hyde, R.A.; Walker, S.; Garcia, M.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001904. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) is a program funded by the U.S. Department of Energy Office of Technology Development. BWID supports the applied research, development, demonstration, testing, and evaluation of a suite of advanced technologies that together form a comprehensive remediation system for the effective and efficient remediation of buried waste. The fiscal year (FY) 1994 effort will fund thirty-eight technologies in five areas of buried waste site remediation: site characterization, waste characterization, retrieval, treatment, and containment/stabilization. This document is the basic operational planning document for deployment of all BWID projects. Discussed in this document are the BWID preparations for INEL field demonstrations, INEL laboratory demonstrations, non-INEL demonstrations, and paper studies. Each technology performing tests will prepare a test plan to detail the specific procedures, objectives, and tasks of each test. Therefore, information specific to testing each technology is intentionally omitted from this document.

499 (ES/ER/TM–58) **Defining the role of risk assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation process at the DOE-OR.** Miller, P.D.; McGinn, C.W.; Purucker, S.T.; White, R.K. Oak Ridge National Lab., TN (United States). Aug 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001870. Source: OSTI; NTIS; INIS; GPO Dep.

The risk assessment strategy that will be implemented on the Oak Ridge Reservation has been standardized to ensure consistency and technical defensibility in all risk assessment activities and is presented within this document. The strategy emphasizes using existing environmental data in screening risk analyses to aid in

identifying chemicals of potential concern, operable units that could pursue a no further investigation determination, and operable units that may warrant early response actions. The screening risk analyses include a comparison of measured chemical concentrations to preliminary remediation goals, performing a most likely exposure and integration point assessment, and performing a screening ecological risk assessment. This document focuses heavily on the screening risk analyses and relies on existing U.S. Environmental Protection Agency risk assessment guidance to provide specific details on conducting baseline risk assessments. However, the document does contain a section on the baseline risk assessment process that details the exposure pathways to be evaluated on the Oak Ridge Reservation. This document will be used in conjunction with existing Martin Marietta Energy Systems, Inc. Environmental Restoration risk assessment standards, policies, procedures, and technical memoranda. The material contained herein will be periodically updated as the strategy is tried and tested and as the risk assessment methodology is revised. The primary purpose for this document is to present the proposed strategy to the Tennessee Department of Environment and Conservation and the U.S. Environmental Protection Agency, Region IV and receive concurrence or additional comments on the material presented herein.

500 (ES/ER/TM–104) **Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities.** Etnier, E.L.; Houlberg, L.M.; Bock, R.E. Oak Ridge National Lab., TN (United States). Jun 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002295. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to address regulatory requirements for decontamination and decommissioning (D and D) activities at the Oak Ridge Reservation and Paducah Gaseous Diffusion Plant. This report is a summary of potential federal and state regulatory requirements applicable to general D and D activities. Excerpts are presented in the text and tables from the complete set of regulatory requirements. This report should be used as a guide to the major regulatory issues related to D and D. Compliance with other federal, state, and local regulations not addressed here may be required and should be addressed carefully by project management on a site-specific basis. The report summarizes the major acts and implementing regulations (e.g., Resource and Conservation Recovery Act, Clean Air Act, and Toxic Substances Control Act) only with regard to D and D activities. Additional regulatory drivers for D and D activities may be established through negotiated agreements, such as the Federal Facility Agreement and the US Environmental Protection Agency Mixed Waste Federal Facility Compliance Agreement; these are discussed in this report. The DOE orders and Energy Systems procedures also are summarized briefly in instances where they directly apply to D and D.

501 (ITRI–143) **Site environmental report: 1993.** Lovelace Biomedical and Environmental Research Inst., Albuquerque, NM (United States). Inhalation Toxicology Research Inst. Oct 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76EV01013. Order Number DE95002969. Source: OSTI; NTIS; INIS; GPO Dep.

The Inhalation Toxicology Research Institute (ITRI) has in place an extensive radiological and nonradiological environmental monitoring program which monitors air emissions, groundwater, soil, and ambient air around the facility. ITRI is operated in a manner that minimizes any adverse impact to the environment. The ITRI facility is in compliance with air quality and hazardous waste regulations. However, due to the previous operations of its six on-site sewage lagoons, groundwater in the ITRI vicinity contains nitrate, total dissolved solids, and sulfate contamination that exceeds state groundwater standards. Also, due to an underground fuel system leak, a localized area of groundwater is contaminated with diesel fuel. In addition, a small quantity of mixed low-level waste generated in the process of laboratory research is presently stored on site while treatment and disposal options are determined. Based on present information, the contaminant plume originating from the sewage lagoons has not migrated off the ITRI site. In addition, a groundwater assessment is underway to determine the extent of groundwater contamination and options for remediation, if required. Diesel fuel leaks and spills have been characterized, and the extent of the contamination is currently being assessed with five new monitoring wells, MW-12 through –15. All underground tanks and fuel lines have been removed, along with associated contaminated soil. A soil venting and volatilization remediation system continues to operate in the area of a fuel leak, where further remediation may be required to remove diesel oil in the groundwater.

502 (LA–12846-MS) **Specific activities and DOE-STD-1027-92 hazard Category 2 thresholds, LANL fact sheet.** Clow, J.; DeVore, R.; Elder, J.; Heindel, G.; Inkret, W.; Miller, G. Los Alamos National Lab., NM (United States). Nov 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001874. Source: OSTI; NTIS; INIS; GPO Dep.

Data tables are presented to provide consistency in safety analysis work at the Los Alamos National Laboratory. Included are calculated specific activities and calculated hazard classification Category 2 threshold quantities for radionuclides listed in DOE-STD-1027-92. Some calculated threshold quantities differ from the DOE thresholds. Calculated specific activities are also presented for plutonium material types or mixtures.

503 (LA-UR–94-3373) **Magnetic separation for environmental remediation.** Schake, A.R. (Los Alamos National Lab., NM (United States)); Avens, L.R.; Hill, D.D.; Padilla, D.D.; Prenger, C.; Romero, D.A.; Worl, L.A.; Tolt, T.L. Los Alamos National Lab., NM (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940301–44: 207. spring national meeting of the American Chemical Society (ACS), San Diego, CA (United States), 13-18 Mar 1994). Order Number DE95002723. Source: OSTI; NTIS; GPO Dep.

High Gradient Magnetic Separation (HGMS) is a form of magnetic separation used to separate solids from other solids, liquids or gases. HGMS uses large magnetic field gradients to separate ferromagnetic and paramagnetic particles from diamagnetic host materials. The technology relies only on physical properties, and therefore separations can be achieved while producing a minimum of secondary waste. Actinide and fission product wastes within the DOE weapons complex pose challenging problems for environmental remediation. Because the majority of actinide complexes and many fission products are paramagnetic, while most host materials are diamagnetic, HGMS can be used to concentrate the contaminants into a low volume waste stream. The authors are currently developing HGMS for applications to soil decontamination, liquid waste treatment, underground storage tank waste treatment, and actinide chemical processing residue concentration. Application of HGMS usually involves passing a slurry of the contaminated mixture through a magnetized volume. Field gradients are produced in the magnetized volume by a ferromagnetic matrix material, such as steel wool, expanded metal, iron shot, or nickel foam. The matrix fibers become trapping sites for ferromagnetic and paramagnetic particles in the host material. The particles with a positive susceptibility are attracted toward an increasing magnetic field gradient and can be extracted from diamagnetic particles, which react in the opposite direction, moving away from the areas of high field gradients. The extracted paramagnetic contaminants are flushed from the matrix fibers when the magnetic field is reduced to zero or when the matrix canister is removed from the magnetic field. Results are discussed for the removal of uranium trioxide from water, PuO_2, U, and Pu from various soils (Fernald, Nevada Test Site), and the waste water treatment of Pu and Am isotopes using HGMS.

504 (ORNL–6807) **Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V).** Foley, R.D.; Cottrell, W.D.; Johnson, C.A. Oak Ridge National Lab., TN (United States). Sep 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001825. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the US Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted an independent verification radiological and non-radioactive beryllium survey at the Sacandaga Site, located on Sacandaga Road, Glenville, New York following limited remediation of the site by Allwash of Syracuse, Inc. At the time of this survey, only building P was still standing. A

small concrete structure at the east of the property had been demolished and the debris hauled away, leaving only a pit. The purpose of the survey, conducted between April and August 1993, was to confirm the success of the remedial actions performed to remove any beryllium concentrations or radioactive materials in excess of the identified guidelines. The verification survey included surface gamma scans and gamma readings at 1 meter indoors and outdoors, alpha and beta scans inside building P, and the collection of soil, dust and debris samples and smears for radionuclide and beryllium analyses. Results of the survey demonstrated that all radiological and beryllium measurements on the property were within applicable DOE guidelines. Based on all data collected. the Sacandaga Site, Glenville, New York, conforms to all applicable radiological and non-radioactive beryllium guidelines established for this site by DOE and approved by the State of New York.

505 (ORNL–6808) **Results of the radiological and beryllium verification survey at the Peek Street Site, Schenectady, New York (SY001V).** Foley, R.D.; Johnson, C.A.; Carrier, R.F.; Allred, J.F. Oak Ridge National Lab., TN (United States). Oct 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002491. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted an independent verification radiological and non-radioactive beryllium survey at the Peek Street site, located at 425 Peek Street, Schenectady, New York. The purpose of the survey, conducted during 1993 and continuing through January 1994, was to confirm the success of the remedial actions performed to remove any beryllium concentrations or radioactive materials in excess of the identified guidelines. The verification survey included surface gamma scans and gamma readings at one meter indoors and outdoors, alpha and beta scans inside the structure, and the collection of soil, dust and debris samples and smears for radionuclide and beryllium analyses. Results of the survey demonstrated that all radiological and beryllium measurements on the property were within applicable DOE guidelines. Based on all data collected, the industrial property at 425 Peek Street and the adjacent state-owned bike path in Schenectady, New York, conforms to all applicable radiological and non-radioactive beryllium guidelines established for this site by DOE and approved by the State of New York.

506 (ORNL/ER–213/R1) **Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Marsh, J.D.; McCarthy, J.F. Oak Ridge National Lab., TN (United States). Environmental Sciences Div. Jul 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002294. Source: OSTI; NTIS; INIS; GPO Dep.

This Work Plan/Site Safety and Health Plan (SSHP) and the attached work plan are for the performance of the colloid sampling project at WAG 5. The work will be conducted by the Oak Ridge National Laboratory (ORNL) Environmental Sciences Division (ESD) and associated ORNL environmental, safety, and health support groups. This activity will fall under the scope of 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response (HAZWOPER). The purpose of this document is to establish health and safety guidelines to be followed by all personnel involved in conducting work for this project. Work will be conducted in accordance with requirements as stipulated in the ORNL HAZWOPER Program manual, and applicable ORNL, Martin Marietta Energy Systems, Inc., and US Department of Energy (DOE) policies and procedures.

507 (ORNL/ER–235) **Waste management plan for the remedial investigation of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Baron, L.A. Oak Ridge National Lab., TN (United States). Oct 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002308. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Waste Management Plan defines the criteria and methods to be used for managing waste generated during activities associated with Waste Area Grouping 2 at Oak Ridge National Laboratory. The waste management strategy is based on the generation and management of waste on a systematic basis using the most appropriate combination of waste reduction, segregation, treatment, storage, and disposal practices while protecting the environment and human health, maintaining as low as reasonably achievable limits. This plan contains provisions for safely and effectively managing soils and sediments, sampling water, decontamination fluids, and disposable personal protective equipment consistent with the US Environmental Protection Agency guidance. This plan will be used in conjunction with the ORNL ER Program Waste Management Plan.

508 (ORNL/ER/Sub–87-99053/73) **Site characterization report for Building 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Aug 1994. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE94019249. Source: OSTI; NTIS; INIS; GPO Dep.

Engineering drawings for this project are identified as CAPE-3085. Inquiries may be directed to: Office of Scientific and Technical Information, P. O. Box 62, Oak Ridge, TM 37831.

Building 3515 at Oak Ridge National Laboratory (ORNL), also known as the Fission Product Pilot Plant, is a surplus facility in the main plant area to the east of the South Tank Farm slated for decontamination and decommissioning (D&D). The building consists of two concrete cells (north and south) on a concrete pad and was used to extract radioisotopes of ruthenium, strontium, cesium, cerium, rhenium and other elements from aqueous fission product waste. Site characterization activities of the building were initiated. The objective of the site characterization was to provide information necessary for engineering evaluation and planning of D&D approaches, planning for personal protection of D&D workers, and estimating waste volumes from D&D activities. This site characterization report documents the investigation with a site description, a summary of characterization methods, chemical and radiological sample analysis results, field measurement results, and waste volume estimates.

509 (PNL–9424) **Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method.** Wright, J. (Pacific Northwest Lab., Richland, WA (United States)); Conca, J.L.; Chen, X. Pacific Northwest Lab., Richland, WA (United States). Mar 1994. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001462. Source: OSTI; NTIS; INIS; GPO Dep.

The simulation of contaminant migration and movement through subsurface materials surrounding hazardous and mixed waste sties requires knowledge of the transport characteristics of the soils, sediments, and rocks of the site under unsaturated and saturated conditions. The hydraulic conductivity, diffusion coefficient, and retardation factor must be known in order to use existing and developing models of contaminant release from subsurface systems. The new Unsaturated Flow Apparatus (UFA) method makes it possible to measure transport parameters in a very short time while replicating the wide range of conditions that exist in the field. The chemical, physical, and mineralogical properties of each soil sample are compared to transport parameters measured by the UFA method to determine the primary physical parameter/hydrologic characteristic relationships for predicting volatile organic compound (VOC) and water migration in arid soils and sediments. The Plutonium Finishing Plant in the 200-West Area at the Hanford Site is the site of a mixed-waste contaminant plume. The plume contains carbon tetrachloride (CCl_4) as the primary VOC, Pu and Am as the primary radionuclides, water, aqueous sodium nitrate solutions, and other organics (lard oil, tributylphoshate, chloroform). An estimated 3.5 million gal of liquid waste was discharged to three unlined cribs (similar to septic tanks drain fields) between 1955 and 1973. This project investigated unsaturated transport phenomena using the new UFA method to optimize long-term experimental and demonstration strategies for site remediation. Three unexpected benefits resulted from the UFA method in FY 1993: hydrostratigraphic mapping, subsurface flux and recharge mapping, and pore water

extraction from vadose zone samples for chemical analysis. 54 refs.

510 (PNL–10123) **Manipulation of natural subsurface processes: Field research and validation: Interim report.** Fruchter, J.S. (and others); Spane, F.A.; Amonette, J.E. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003174. Source: OSTI; NTIS; INIS; GPO Dep.

Often the only alternative for treating deep subsurface contamination is in situ manipulation of natural processes to change the mobility or form of contaminants. However, the complex interactions of natural subsurface physical, chemical, and microbial processes limit the predictability of the system-wide impact of manipulation based on current knowledge. This report is a summary of research conducted to examine the feasibility of controlling the oxidation-reduction (redox) potential of the unconfined aquifer at the Hanford Site in southeastern Washington State by introducing chemical reagents and microbial nutrients. The experiment would allow the testing of concepts and hypotheses developed from fundamental research in the US Department of Energy's (DOE's) Subsurface Science Program. Furthermore, the achievement of such control is expected to have implications for in situ remediation of dispersed aqueous contaminants in the subsurface environment at DOE sites nationwide, and particularly at the Hanford Site. This interim report summarizes initial research that was conducted between July 1990 and October 1991.

511 (PNL–10133) **Descriptions of representative contaminated sites and facilities within the DOE complex.** Short, S.M. (Pacific Northwest Lab., Richland, WA (United States)); Buck, J.W.; Clark, L.L.; Fletcher, J.F.; Glantz, C.S.; Holdren, G.R.; Huesties, L.R.; Williams, M.D.; Oates, L. Battelle Pacific Northwest Lab., Richland, WA (United States); Oak Ridge National Lab., TN (United States). Oct 1994. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830 ; AC05-84OR21400. Order Number DE95001854. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has initiated efforts to prepare a Programmatic Environmental Impact Statement (PEIS) that will analyze the existing environmental restoration and waste management program and evaluate alternatives for an integrated program. The alternatives being evaluated include (1) a "No Action" alternative as required by the National Environmental Policy Act (NEPA), (2) an Applicable, Relevant, and Appropriate Requirements (ARAR)-driven alternative, (3) a land-use-driven alternative, (4) a health-risk-driven alternative, and (5) a combination land-use and health-risk-driven alternative. The analytical approach being taken to evaluate each of these alternatives is to perform a remedial engineering analysis and human health and ecosystem effects analyses on every contaminated site and facility in the DOE complex. One of Pacific Northwest Laboratory's (PNL) roles in this approach has been to compile the source term and environmental setting data needed to drive each of these analyses. To date, over 10,000 individual contaminated sites and facilities located throughout the DOE complex of installations have been identified and at least some minimal data compiled on each. The PEIS analyses have been appreciably simplified by categorizing all of these contaminated sites and facilities into six broad categories: (1) contaminated buildings, (2) contaminated soils, (3) solid waste sites (e.g., burial grounds), (4) liquid containment structures (e.g., tanks), (5) surface water sites, and (6) contaminated groundwater sites. A report containing a complete description of each of these thousands of contaminated sites and facilities would be tremendously large and unwildy, as would separate reports describing the application of the analytical methodologies to each.

512 (PNL–10189) **Toxicologic evaluation of analytes from Tank 241-C-103.** Mahlum, D.D.; Young, J.Y.; Weller, R.E. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003175. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company requested PNL to assemble a toxicology review panel (TRP) to evaluate analytical data compiled by WHC, and provide advice concerning potential health effects associated with exposure to tank-vapor constituents. The team's objectives would be to (1) review procedures used for sampling vapors from tanks, (2) identify constituents in tank-vapor samples that could be related to symptoms reported by workers, (3) evaluate the toxicological implications of those constituents by comparison to establish toxicological databases, (4) provide advice for additional analytical efforts, and (5) support other activities as requested by WHC. The TRP represents a wide range of expertise, including toxicology, industrial hygiene, and occupational medicine. The TRP prepared a list of target analytes that chemists at the Oregon Graduate Institute/Sandia (OGI), Oak Ridge National Laboratory (ORNL), and PNL used to establish validated methods for quantitative analysis of head-space vapors from Tank 241-C-103. this list was used by the analytical laboratories to develop appropriate analytical methods for samples from Tank 241-C-103. Target compounds on the list included acetone, acetonitrile, ammonia, benzene, 1, 3-butadiene, butanal, n-butanol, hexane, 2-hexanone, methylene chloride, nitric oxide, nitrogen dioxide, nitrous oxide, dodecane, tridecane, propane nitrile, sulfur oxide, tributyl phosphate, and vinylidene chloride. The TRP considered constituent concentrations, current exposure limits, reliability of data relative to toxicity, consistency of the analytical data, and whether the material was carcinogenic or teratogenic. A final consideration in the analyte selection process was to include representative chemicals for each class of compounds found.

513 (SAND–94-1237) **A review of technology for contact protection of remediation manipulators (WHC Issue 39).** Thunborg, S. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001794. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation of waste from Underground Storage Tanks (UST) at Hanford will require the use of large remotely controlled equipment. Inherent safety methods need to be identified and incorporated into the retrieval system to prevent contact damage to the UST or to the remediation equipment. This report discusses the requirements for an adequate protection system and reviews the major technologies available for inclusion in a damage protection system. The report proposes that adequate reliability of a protection system can be achieved through the use of two fully-independent subsafety systems. Safety systems technologies reviewed were Force/Torque Sensors, Overload Protection Devices, Ultrasonic Sensors, Capacitance Sensors, Controller Software Limit Graphic Collision Detection, and End Point Tracking. A relative comparison between retrieval systems protection technologies is presented.

514 (SAND–94-2703C) **A Sandia National Laboratories decontamination and demolition success story.** Miller, D.R.; Barber, D.S.; Lipka, G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941102–30: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95002189. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories/New Mexico (SNL/NM) has established a formal facility assessment, decontamination and demolition oversight process with the goal of ensuring that excess or contaminated facilities are managed in a cost-effective manner that is protective of human health and the environment. The decontamination and demolition process is designed so that all disciplines are consulted and have input from the initiation of a project. The committee consists of all essential Environmental, Safety and Health (ES and H) and Facilities disciplines. The interdisciplinary-team approach has provided a mechanism that verifies adequate building and site assessment activities are conducted. This approach ensures that wastes generated during decontamination and demolition activities are handled and disposed according to Department of Energy (DOE), Federal, state, and local requirements. Because of the comprehensive nature of the SNL decontamination and demolition process, the strategy can be followed for demolition, renovation and new construction projects, regardless of funding

source. An overview of the SNL/NM decontamination and demolition process is presented through a case study which demonstrates the practical importance of the formal process.

515 (UCRL-ID–113867-94) **LLNL NESHAPs, 1993 annual report.** Harrach, R.J.; Surano, K.A.; Biermann, A.H.; Gouveia, F.J.; Fields, B.C.; Tate, P.J. Lawrence Livermore National Lab., CA (United States). Jun 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95002593. Source: OSTI; NTIS; INIS; GPO Dep.

The standard defined in NESHAPSs CFR Part 61.92 limits the emission of radionuclides to the ambient air from DOE facilities to those that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem. In August 1993 DOE and EPA signed a Federal Facility Compliance Agreement which established a schedule of work for LLNL to perform to demonstrate compliance with NESHAPs, 40 CFR part 61, Subpart H. The progress in LLNL's NESHAPs program - evaluations of all emission points for the Livermore site and Site 300, of collective EDEs for populations within 80 km of each site, status in reguard to continuous monitoring requirements and periodic confirmatory measurements, improvements in the sampling and monitoring systems and progress on a NESHAPs quality assurance program - is described in this annual report. In April 1994 the EPA notified DOE and LLNL that all requirements of the FFCA had been met, and that LLNL was in compliance with the NESHAPs regulations.

516 (UCRL-ID–116220) **Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program.** Couture, S. Lawrence Livermore National Lab., CA (United States). 18 Feb 1994. 324p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95000512. Source: OSTI; NTIS; INIS; GPO Dep.

One tool being developed for dislodging and fragmenting the hard salt cake waste in the single-shell nuclear waste tanks at the Hanford Reservation near Richland, Washington, is the hydraulic impact end effector (HIEE). This total operates by discharging 11-in. slugs of water at ultrahigh pressures. The HIEE was designed, built, and initially tested in 1992. Work in 1993 included advanced developments of the HIEE to further investigate its fragmentation abilities and to determine more effective operating procedures. These tests showed that more fragmentation can be achieved by increasing the charge pressure of 40 kpsi to 55 kpsi and by the use of different operating procedures. The size of the material and the impact energy of the water slug fired from the HIEE are believed to be major factors in material fragmentation. The material's ability to fracture also appears to depend on the distance a fracture or crack line must travel to a free surface. Thus, larger material is more difficult to fracture than smaller material. Discharge pressures of 40 kpsi resulted in little penetration or fracturing of the material. At 55 kpsi, however, the size and depth of the fractures increased. Nozzle geometry had a significant effect on fragment size and quantity. Fragmentation was about an order of magnitude greater when the HIEE was discharged into drilled holes rather than onto the material surface. Since surface shots tend to create craters, a multi-shot procedure, coupled with an advanced nozzle design, was used to drill (crater) deep holes into large material. With this procedure, a 600-lb block was reduced to smaller pieces without the use of any additional equipment. Through this advanced development program, the HIEE has demonstrated that it can quickly fragment salt cake material into small, easily removable fragments. The HIEE's material fragmentation ability can be substantially increased through the use of different nozzle geometries and operating procedures.

517 (WHC-EP–0694) **Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils.** Thornton, E.C. (Westinghouse Hanford Co., Richland, WA (United States)); Baechler, M.A.; Beck, M.A.; Amonette, J.E. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001554. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-scale soil treatment tests were conducted as part of an effort to develop and implement an in situ chemical treatment approach to the remediation of metal and radionuclide contaminated soils through the use of reactive gases. In general, > 90% immobilization of chromium and > 50% immobilization of uranium was achieved. Leach test results indicate that the treatment process is irreversible for chromium but partially reversible for uranium indicates that immobilization for this contaminant is more readily achieved in organic rich soils. This observation is ascribed to the reducing nature of organic matter. Additional tests were also conducted with soils contaminated to the 5,000 ppm level with nitrate. Nitrate was not found to interfere significantly with treatment of the contaminants. Nitrite was observed in the leachate samples obtained from tests with an organic-rich soil containing clay, however. Leachate chemistries suggested that no other significantly hazardous byproducts were generated by the treatment process and that soil alteration effects were minimal. Test results also suggest that treatment effectiveness is somewhat lower in very dry soils but still able to immobilize chromium and uranium to an acceptable degree. Results of these testing activities indicate that the concentration of hydrogen sulfide in the gas mixture is not a limited factor in treatment as long as a sufficient volume of the mixture is delivered to the soil to achieve a mole ratio of hydrogen sulfide to contaminant of at least 10.

518 (WHC-EP–0782-Vol.1) **Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary.** Peters, B.B. (Enserch Environmental Corp., Richland, WA (United States)); Cameron, R.J.; McCormack, W.D. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001846. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a System Analysis Model developed under the US Department of Energy (DOE) Office of Technology Development (OTD) Underground Storage Tank-Integrated Demonstration (UST-ID) program to aid technology development funding decisions for radioactive tank waste remediation. Current technology development selection methods evaluate new technologies in isolation from other components of an overall tank waste remediation system. These methods do not show the relative effect of new technologies on tank remediation systems as a whole. Consequently, DOE may spend its resources on technologies that promise to improve a single function but have a small or possibly negative, impact on the overall system, or DOE may overlook a technology that does not address a high priority problem in the system but that does, if implemented, offer sufficient overall improvements. Systems engineering and detailed analyses often conducted under the National Environmental Policy Act (NEPA 1969) use a "whole system" approach but are costly, too time-consuming, and often not sufficiently focused to support the needs of the technology program decision-makers. An alternative approach is required to evaluate these systems impacts but still meet the budget and schedule needs of the technology program.

519 (WHC-EP–0782-Vol.2) **Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report.** Peters, B.B. (Enserch Environmental Corp., Richland, WA (United States)); Cameron, R.J.; McCormack, W.D. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 452p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001847. Source: OSTI; NTIS; INIS; GPO Dep.

Contains 2 disks.

The objective of DOE's Radioactive Waste Tank Remediation Technology Focus Area is to identify and develop new technologies that will reduce the risk and/or cost of remediating DOE underground waste storage tanks and tank contents. There are, however, many more technology investment opportunities than the current budget can support. Current technology development selection methods evaluate new technologies in isolation from other components of an overall tank waste remediation system. This report describes a System Analysis Model developed under the US Department of Energy (DOE) Office of Technology Development (OTD) Underground Storage Tank-Integrated Demonstration (UST-ID) program. The report identifies the project objectives and provides a description of the model. Development of the first "demonstration" version of this model and a trial application have

been completed and the results are presented. This model will continue to evolve as it undergoes additional user review and testing.

520 (WHC-SA–1455) **Accelerated clean-up at the Hanford Site.** Frain, J.M.; Johnson, W.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-920307–103: Waste management '92, Tucson, AZ (United States), 1-5 Mar 1992). Order Number DE94017416. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site began operations in 1943 as one of the sites for plutonium production associated with the Manhattan Project. It has been used, in part, for nuclear reactor operation, reprocessing of spent fuel, and management of radioactive waste. The Hanford Site covers approximately 1,434 km^2 (560 $mi^2$2) in southeastern Washington State. The subject of this paper, the 618-9 Burial Ground, is located on the Hanford Site approximately 1.6 km (1 mi) west of the Columbia River, and a few miles north of Richland, Washington. Throughout Hanford Site history, prior to legislation regarding disposal of chemical waste products, some chemical waste byproducts were disposed ,ia burial in trenches. One such trench was the 618-9 Burial Ground. This burial ground was suspected to contain approximately 19,000 L (5,000 gal) of uranium-contaminated organic solvent, disposed in standard 55-gal (208-L) metal drums. The waste was produced from research and development activities related to fuel reprocessing.

521 (WHC-SA–2235) **A team leadership approach to managing the transition from construction to operations for an environmental project.** Kelly, J.W. Westinghouse Hanford Co., Richland, WA (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941091–2: 25. Project Management Institute annual seminar and symposium, Vancouver (Canada), 17-19 Oct 1994). Order Number DE94018150. Source: OSTI; NTIS; INIS; GPO Dep.

This presentation describes a team approach, at the totalproject level that focused team members with common objectives, for the transition to start-up and operation of the project. The Integrated Management Team (IMT) approach has been successful for this US Department of Energy (DOE) environmental restoration project at the Hanford Site in Richland, Washington. The $53.8-million project will collect, treat, and dispose of low-level mixed waste water discharges from the Hanford Site. Construction is scheduled for completion in September 1994 and facility start-up in June 1995. The project challenge is for leadership that is committed to the transition from construction to operation of the environmental restoration project.

522 (WHC-SA–2653) **The history and legacy of Project X.** Watson, D.J.; Johnson, R.S. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-941207–10: Spent nuclear fuel meeting: challenges and initiatives; Emerging technologies in hazardous waste management conference, Salt Lake City, UT (United States); Atlanta, GA (United States), 14-16 Dec 1994; 13-16 dec 1994; CONF-941237–1). Order Number DE95001630. Source: OSTI; NTIS; INIS; GPO Dep.

About 2,100 metric tons of irradiated uranium materials (i.e. spent fuel) are stored at the US Department of Energy's (DOE's) Hanford Site in southeastern Washington state. This is the largest single inventory of spent fuel in wet storage in the DOE complex. This spent fuel is currently stored in two separate fuel storage basins which were constructed to store spent fuel from Hanford's K-East (KE) and K-West (KW) reactors which were deactivated in the early 1970's. The information below provides a description of the operational history of the facilities and discusses the current environmental and waste management challenges facing continued operations at these facilities. It also serves as a driving force for arriving at an alternative storage configuration for spent fuel until a final disposition method of the spent fuel is determined through the NEPA process.

523 (WHC-SD-GN-TRP–20024) **Load test of the 272E Building high bay roof deck and support structure.** McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 1 Nov 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95003073. Source: OSTI; NTIS; INIS; GPO Dep.

The 272E Building high bay roof area was load tested according to the approved load-test procedure. The 272E Building is located in the 200 East Area of the Hanford Site and has the following characteristics: Roof deck – wood decking supported by 4 x 14 timber purlins; Roof membrane – tar and gravel; Roof slope – flat (<10 deg); and Roof elevation – maximum height of about 63 ft. The 272 Building was visited in August 1992 for a visual inspection. During this inspection, cracked areas were visible in the decking, but it was not possible to determine whether these cracks extended completely through the decking, which is 2-in. thick. The building was revisited in March 1994 for the purpose of writing this test report. Because the roof requires personnel access, a test was determine to be the best way to qualify the roof. The pre-test briefing consisted of filling out the pre-test checklist, discussing proper lifting techniques, reviewing the fall-protection plan, reviewing the job hazards analysis, and reviewing the robot travel path. The load-test results consist of visual observations and the test engineer's conclusions. Visual observations found no adverse conditions such as large deflections or permanent deformations. No deflection measurements were recorded because the tar and gravel on roof get displaced by the robot tracks; the result is large variations in deflection measurements. The conclusions are that the roof has been qualified for 500-lb total roof load and that the "No Roof Access" signs can be changed to "Roof Access Restricted" signs.

524 (WHC-SD-GN-TRP–30011) **Load test of the 3701D Building roof deck and support structure.** McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 16 Sep 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001041. Source: OSTI; NTIS; INIS; GPO Dep.

This reports the results of the load test of the 3701D Building roof deck and support structure.

525 (WHC-SD-GN-TRP–30018) **Load test of the 3790 Building Roof Deck and Support Structure.** McCoy, R.M. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001538. Source: OSTI; NTIS; INIS; GPO Dep.

This reports the results of the load test of the 3790 building roof deck and support structure.

526 (WHC-SD-SNF-SARR–002-Rev.1) **Safety assessment of discharge chute isolation barrier preparation and installation: Revision 1.** Meichle, R.H. Westinghouse Hanford Co., Richland, WA (United States). 10 Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002096. Source: OSTI; NTIS; INIS; GPO Dep.

This revision responds to RL comments and increases the discussion of the "effective hazard categorization" and the readiness review basis. The safety assessment is made for the activities for the preparation and installation of the discharge chute isolation barriers. The safety assessment includes a hazard assessment and comparison of potential accidents/events to those addressed by the current safety basis documentation. No significant hazards were identified. An evaluation against the USQ evaluation questions were made and the determination made that the activities do not represent a USQ. Hazard categorization techniques were used to provide a basis for readiness review classification.

527 (WHC-SD-SQA-CSA–20374) **CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T.** Chiao, T. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001644. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium Finish Plant (PFP) Engineering requested a criticality safety evaluation (Appendix 1) to support a revision of Criticality Prevention Specification CPS-Z-165-80601 allowing a plexiglass enclosure (PGE) to be placed inside the HC-227T hood as a contamination barrier. The HC-227T hood is the receiving/transfer

enclosure for Pu nitrate solution contained in Product Removal containers (PR Cans), L10 Containers (L10, Fl-10, 10 L) or L-3 Containers. Within the HC-227T, a 1.349 square meter (15 square foot) enclosure, PGE, has been created to provide contamination control around the weighing scale. Two or more standard criticality drains shall be installed on this enclosure prior to beneficial usage. The evaluation considered the normal process, spillage scenarios, waste/container accumulations within the enclosure, and interactions of Pu within the enclosure as well as other containers external to the enclosure. The results from the criticality safety analysis by CRA shows that such as contamination barrier can be placed inside the HC-227T Hood if the PGE is equipped with adequate criticality drains. In addition, other limits as well as administrative controls listed in CPS-Z-165-80601 Rev./Mod. B/0 and CPS-Z-165-80010 Rev./Mod. C/1 shall also apply.

528 (WHC-SD-WM-DQO-011-Rev.1) **Interim data quality objectives for waste pretreatment and vitrification: Revision 1.** Kupfer, M.J.; Conner, J.M.; Kirkbride, R.A.; Mobley, J.R. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001570. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) is responsible for storing, processing, and immobilizing the Hanford Site tank wastes. Characterization information on the tank wastes is needed so that safety concerns can be addressed, and retrieval, pretreatment, and immobilization processes can be designed, permitted, and implemented. This document describes the near-term tank waste sampling and characterization needs of the Pretreatment, High-Level Waste (HLW) Disposal, and Low-Level Waste (LLW) Disposal Programs to support the TWRS disposal mission. The final DQO (Data Quality Objective) will define specific waste tanks to be sampled, sample timing requirements, an appropriate analytical scheme, and a list of required analytes. This interim DQO, however, focuses primarily on the required analytes since the tanks to be sampled in FY 1994 and early FY 1995 are being driven most heavily by other considerations, particularly safety. The major objective of this Interim DQO is to provide guidance for tank waste characterization requirements for samples taken before completion of the final DQO. The characterization data needs defined herein will support the final DQO to help perform the following: Support the TWRS technical strategy by identification of the chemical and physical composition of the waste in the tanks and Guide development efforts to define waste pretreatment processes, which will in turn define HLW and LLW feed to vitrification processes.

529 (WHC-SD-WM-ES-300) **Feasibility study of tank leakage mitigation using subsurface barriers.** Treat, R.L. (Ensearch Environmental, Inc. (United States)); Peters, B.B.; Cameron, R.J.; McCormak, W.D.; Trenkler, T.; Walters, M.F.; Rouse, J.K.; McLaughlin, T.J.; Cruse, J.M. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1994. 355p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001511. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has established the Tank Waste Remediation System (TWRS) to satisfy manage and dispose of the waste currently stored in the underground storage tanks. The retrieval element of TWRS includes a work scope to develop subsurface impermeable barriers beneath SSTs. The barriers could serve as a means to contain leakage that may result from waste retrieval operations and could also support site closure activities by facilitating cleanup. Three types of subsurface barrier systems have emerged for further consideration: (1) chemical grout, (2) freeze walls, and (3) desiccant, represented in this feasibility study as a circulating air barrier. This report contains analyses of the costs and relative risks associated with combinations retrieval technologies and barrier technologies that from 14 alternatives. Eight of the alternatives include the use of subsurface barriers; the remaining six nonbarrier alternative are included in order to compare the costs, relative risks and other values of retrieval with subsurface barriers. Each alternative includes various combinations of technologies that can impact the risks associated with future contamination of the groundwater beneath the Hanford Site to varying degrees. Other potential risks associated with these alternatives, such as those related to accidents and airborne contamination resulting from retrieval and barrier emplacement operations, are not quantitatively evaluated in this report.

530 (WHC-SD-WM-ES-313) **B Plant: WESF location study.** Gehrke, J.W. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002209. Source: OSTI; NTIS; INIS; GPO Dep.

This study evaluates the feasibility of isolating WESF from B Plant. The replacement of WESF support systems is evaluated and one alternative recommended for each system, to be part of a combined project. The relationship of this proposed project and the deactivation of B Plant is discussed and a schedule for implementation recommended.

531 (WHC-SD-WM-LL-006) **241-SY-101 air lance removal lessons learned.** Moore, T.L.; Titzler, P.A. Westinghouse Hanford Co., Richland, WA (United States). 11 Oct 1994. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002279. Source: OSTI; NTIS; INIS; GPO Dep.

An emergency task was undertaken to remove four air lances and one thermocouple (TC) tree from tank 241-SY-101 (SY-101). This resulted from video observation that these pipes were being severely bent during periodic gas release events that regularly occurred every three to four months. At the time, the gas release events were considered to be the number one safety issue within the US Department of Energy (DOE) complex. This emergency removal task was undertaken on an extremely short schedule that required all activities possible to be completed in parallel. This approach and extremely short schedule, while successful, resulted in some undesirable consequences from less than desired time for design, reviews, equipment testing, operations training, and bad weather conditions. These consequences included leakage of liquid waste from the containers to the ground, higher than expected dose rates at the container surface, difficult field operations, and unexpected pipe configuration during removal. In addition, changes to environmental regulations and severe winter weather impacted the packaging and shipping activities required the prepare the removed pipes for storage at the Central Waste Complex (CWC). The purpose of this document is to identify lessons to be learned for future activities. In context of the emergency conditions that existed at the time and the urgency to remove these pipes, their removal was successfully completed under extremely difficult conditions and schedule. The success of the task should not be overshadowed by the desire to identify areas needing improvement and lessons to be learned. Many of the lessons identified in this document have already resulted in improved conduct of operations and engineering.

532 (WHC-SD-WM-PRS-014) **B Plant cleanout and stabilization program update.** Gehrke, J.W. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001435. Source: OSTI; NTIS; INIS; GPO Dep.

The B Plant Cleanout and Stabilization Program Update FY1993 committed to an annual update document. The Cleanout and Stabilization Program (CSP) plan, Reference 1, remains as the best source of detailed discussion of CSP work and continues to be valid. The CSP presented a five year plan that left a number of plant systems operational to support WESF (Waste Encapsulation and Storage Facility) capsule storage. It is now apparent that the transition of B Plant to a long-term surveillance and maintenance mode (LTS and M) will be necessary to complete B Plant deactivation. To accomplish the LTS and M mode for B Plant, WESF will need to be physically isolated to allow stand alone operation for many years beyond the anticipated B Plant deactivation. B Plant has processed large quantities (> 100 megacuries) of cesium-137 and strontium-90. Residual radioactive contamination from this processing is in many forms and locations in B Plant. The plant design incorporates many features for radiological containment and confinement and systems to prevent the exposure of plant personnel and the public to excessive radiation. To minimize or reduce the radiological hazard wherever possible this program includes activities in four areas: Prevent Migration of Contamination; Stabilize

Major Radioactive Source Terms; characterize Radioactive Source Terms; and Reduce Radiation Dose Rates. This document will describe work that is need to meet current goals and objectives and work that has changed, been completed, ore redirected. A systems engineering approach to defining this mission was initiated in FY1994 that will also be addressed in this document.

533 (WHC-SD-WM-SAR–064) **Hazard assessments of double-shell flammable gas tanks.** Fox, G.L.; Stepnewski, D.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 194p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001836. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the fourth in a series of hazard assessments performed on the double-shell flammable gas watch list tanks. This report focuses on hazards associated with the double-shell watch list tanks (101-AW, 103-AN, 104-AN, and 105-AN). While a similar assessment has already been performed for tank 103-SY, it is also included here to incorporate a more representative slurry gas mixture and provide a consistent basis for comparing results for all the flammable gas tanks. This report is intended to provide an in-depth assessment by considering the details of the gas release event and slurry gas mixing as the gas is released from the waste. The consequences of postulated gas ignition are evaluated using a plume burn model and updated ignition frequency predictions. Tank pressurization which results from a gas burn, along with the structural response, is also considered. The report is intended to support the safety basis for work activities in flammable gas tanks by showing margins to safety limits that are available in the design and procedures.

534 (WHC-SD-WM-TP–271) **Test plan for core sampling drill bit temperature monitor.** Francis, P.M. Westinghouse Hanford Co., Richland, WA (United States). 5 Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002094. Source: OSTI; NTIS; INIS; GPO Dep.

At WHC, one of the functions of the Tank Waste Remediation System division is sampling waste tanks to characterize their contents. The push-mode core sampling truck is currently used to take samples of liquid and sludge. Sampling of tanks containing hard salt cake is to be performed with the rotary-mode core sampling system, consisting of the core sample truck, mobile exhauster unit, and ancillary subsystems. When drilling through the salt cake material, friction and heat can be generated in the drill bit. Based upon tank safety reviews, it has been determined that the drill bit temperature must not exceed 180 C, due to the potential reactivity of tank contents at this temperature. Consequently, a drill bit temperature limit of 150 C was established for operation of the core sample truck to have an adequate margin of safety. Unpredictable factors, such as localized heating, cause this buffer to be so great. The most desirable safeguard against exceeding this threshold is bit temperature monitoring . This document describes the recommended plan for testing the prototype of a drill bit temperature monitor developed for core sampling by Sandia National Labs. The device will be tested at their facilities. This test plan documents the tests that Westinghouse Hanford Company considers necessary for effective testing of the system.

535 (WHC-SP–1105) **Fire protection program fiscal year 1995 site support program plan, Hanford Fire Department.** Good, D.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002964. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Hanford Fire Department (HFD) is to support the safe and timely cleanup of the Hanford site by providing fire suppression, fire prevention, emergency rescue, emergency medical service, and hazardous materials response; and to be capable of dealing with and terminating emergency situations which could threaten the operations, employees, or interest of the US Department of Energy operated Hanford Site. This includes response to surrounding fire departments/districts under a mutual aid agreement and contractual fire fighting, hazardous materials, and ambulance support to Washington Public Power Supply System (Supply System). The fire department also provides site fire marshal overview authority, fire system testing and maintenance, self-contained breathing apparatus maintenance, building tours and inspections, ignitable and reactive waste site inspections, prefire planning, and employee fire prevention education. This report describes the specific responsibilities and programs that the HFD must support and the estimated cost of this support for FY1995.

536 (WHC-SP–1119) **Radiological control FY 1995 site support program plan WBS 6.7.2.4.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002107. Source: OSTI; NTIS; INIS; GPO Dep.

The 1995 Site Support Program Plan (SSPP) brings year planning and execution year planning into a single document. The plan presented consists of the following four major sections: Overview and Introduction - Health physics has been renamed Radiological Control (RadCon) with the role of protecting workers, the public and the environment from the harmful effects of radiation resulting from the DOE Hanford Site Operations; Cost Baselines which contains cost, technical and schedule baselines; Execution Year work Plan - cost summaries and detailed descriptions of the work to be done; Appendix - including brief description of other project activities directly coupled to RadCon.

537 (WHC-SP–1122-Vol.4) **Site Support Program Plan for ICF Kaiser Hanford Company.** Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002840. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. Contained in this Vol IV is information covering the following: Energy management; general administration of support buildings; electrical safety upgrades; steam electrical recovery project.

538 (WHC-SP–1126-Vol.1) **Transition projects FY 1995 multi-year program/fiscal year work plan WBS 1.3.1. and 7.1.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 528p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001821. Source: OSTI; NTIS; INIS; GPO Dep.

The primary Transition Projects mission is to deactivate facilities on the Hanford site, in preparation for decontamination and decommissioning, and secondarily to provide safe and secure storage of special nuclear materials, nuclear materials, and nuclear fuel. Transition projects will protect the health and safety of the public and of workers, protect the environment, and provide beneficial use of the facilities and other resources. Goals include the following: Achieve deactivation of facilities for transfer to the Hanford Surplus Facility Program, suing PUREX plant deactivation as a model; Achieve excellence in the conduct of operations and maintenance of nuclear facilities in support of the Hanford Site Mission; manage nuclear materials in a safe and secure condition; treat nuclear materials as necessary and store onsite in long-term interim safe storage awaiting a final disposition decision. Description of the program and projects is included.

539 (WHC-SP–1126-Vol.3) **Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1.** Cartmell, D.B. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001823. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a complete listing and time line of transitional projects associated with the Purex/UO3 deactivation project at the Hanford reservation.

540 (WSRC-IM–94-42) **Decommissioning of facilities at the Savannah River Site.** Marek, J.M.; Street, G.H. Westinghouse

Savannah River Co., Aiken, SC (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941148–1: ANS meeting on environmental aspects of decommissioning, decontamination, and/or environmental restoration at nuclear and mixed waste facilities, Washington, DC (United States), 13-17 Nov 1994). Order Number DE95001245. Source: OSTI; NTIS; INIS; GPO Dep.

The transition of surplus Defense Program facilities to Environmental Management is underway at Savannah River Site. Program status and requirements are described.

541 (WSRC-RP–93-67-4-Vol.1) **M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary.** Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1994. 646p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001143. Source: OSTI; NTIS; GPO Dep.

This report describes the groundwater monitoring and corrective action program at the M-Area Hazardous Waste Management Facility (HWMF) at the Savannah River Site (SRS) during fourth quarter 1993 and during the year 1993 as required by South Carolina Hazardous Waste Permit SCI-890-008-989 and section 264.100(g) of the South Carolina Hazardous Waste Management Regulations. Seven hydrogeologic cross section reference maps are included in this section of the report.

542 (WSRC-RP–93-67-4-Vol.3) **M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary.** Evans, C.S.; Washburn, F.; Jordan, J.; Van Pelt, R. Westinghouse Savannah River Co., Aiken, SC (United States). Mar 1994. 362p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001145. Source: OSTI; NTIS; GPO Dep.

This document contains 1:500 foot scale reference maps for ground water contaminant monitoring of the Savannah River Site. Fourteen maps are included.

543 (WSRC-TR–94-0361) **Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G.** Murphy, C.E. Jr. (Savannah River Technology Center, Aiken, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002820. Source: OSTI; NTIS; INIS; GPO Dep.

Measured concentrations of radionuclides and toxic metals are used to calculate the total inventory of in the vegetation growing on the Old F-Area Seepage Basin. Air concentrations and inhalation doses from exposure to smoke from burning the vegetation are calculated to evaluate the effect of open air burning. Radionuclide inventory is one order of magnitude (10 x) less than those necessary to produce a 1 mrem dose. Air concentrations of toxic metals are less than one third the permissible occupational dose.

544 (Y/EN–4688) **The February 21, 1993 tornadoes of East Tennessee.** Fricke, K.E. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Kornegay, F.C. Oak Ridge Y-12 Plant, TN (United States). 11 Aug 1993. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-9310102–49: 4. energy natural phenomena hazards mitigation conference, Atlanta, GA (United States), 19-22 Oct 1993). Order Number DE95001694. Source: OSTI; NTIS; INIS; GPO Dep.

A series of tornadoes struck the east Tennessee area on Sunday afternoon, February 21, 1993 around Knoxville, Lenoir City, and Oak Ridge causing millions of dollars worth of damage to both homes and businesses in the area, killing one, injuring a number of persons, and leaving a large area without power for many hours or even days due to damage to the local TVA transmission line network. One tornado touched down in the Department of Energy Oak Ridge Reservation near the Oak Ridge Y-12 Plant, continued through the Union Valley business district located just east of the plant, through the adjacent University of Tennessee Arboretum and then continued into the communities of Claxton and Powell. The path length of the tornado was approximately 13 miles. Damage to the Y-12 Plant was minimal, but the Union Valley business district was seriously damaged, including the Fusion Energy Design Center (FEDC) which houses a number of DOE related projects. The preliminary cost estimate of the damage to DOE facilities (both at Y-12 and at the FEDC) was around $520,000. This paper describes the local meteorological data, the tornado that struck near the Y-12 plant, the resulting damage both to the DOE facilities and to the surrounding communities, the plant emergency response and recovery activities, and the current hazard analyses being undertaken at the plant.

545 (Y/SUB–94-99069C/Y15/10) **Site-specific standard request for Underground Storage Tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility Buildings 9754-1 and 9720-15.** Oak Ridge National Lab., TN (United States). Aug 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95001696. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a site-specific standard request for underground storage tanks located at the Rust Garage Facility. These standards are justified based on conclusion derived from the exposure assessment that indicates there is no current or forseeable future human health risk associated with petroleum contaminants on the site, that current and future ecological risks would be generally limited to subsurface species and plant life with roots extending into the area, and that most of the impacted area at the site is covered by asphalt or concrete. The vertical and horizontal extent of soil and ground water contamination are limited to immediate area of the Rust Garage Facility.

546 (Y/TS–1015/R2) **Resource Conservation and Recovery Act (RCRA) contingency plan for hazardous waste treatment, storage, and disposal units at the Oak Ridge Y-12 Plant.** Oak Ridge Y-12 Plant, TN (United States). Aug 1994. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95001692. Source: OSTI; NTIS; INIS; GPO Dep.

The Y-12 RCRA Contingency Plan will be continually reviewed and revised if any of the following occur: the facility permit is revised, the plan is inadequate in an emergency, the procedures can be improved, the operations of the facility change in a way that alters the plan, the emergency coordinator changes, or the emergency equipment list changes. Copies of the Y-12 Emergency Management Plan are available at the Plant Shift Superintendent's Office and the Emergency Management Office. This document serves to supplement the Y-12 Emergency Management Plan to be appropriate for all RCRA hazardous waste treatment, storage, or disposal units. The 90-day accumulation areas at the Y-12 Plant have a separate contingency supplement as required by RCRA and are separate from this supplement.

0550 Safeguards, Inspection, and Accountability

Refer also to citation(s) 151, 250, 538, 539, 569, 571, 572, 573, 574, 575, 576, 577, 946, 951

547 (DOE/AN/ACNT–94C) **Arms control and nonproliferation technologies, third quarter 1994: Dismantlement transparency.** Staehle, G.; Talaber, C.; Stull, S. (eds.). USDOE Office of Nonproliferation and National Security, Washington, DC (United States). 1994. 46p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001068. Source: OSTI; NTIS; GPO Dep.

The recent history-making agreements between the US and Russia to cooperate in dismantling existing nuclear weapons stockpiles point to the need for methods that can confirm, without revealing sensitive design information, that fissile material has indeed been removed from weapons. Methods for safe handling, storage, and transparent recordkeeping are needed as well. The issue of Arms Control and Nonproliferation Technologies highlights the Department of Energy's current efforts in developing such technologies for nuclear weapon and fissile material control. Overview articles address the technical challenges of storage and inspection regimes for weapon components. Other articles present specific technologies for handling and dismantling components; for compliance with transportation requirements; for monitoring systems, both local and

dispersed, based on nuclear radiation measurements; for monitoring without radiation detection; and for managing the immense amounts of information needed to track dismantled components. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

548 (DOE/RL–94-113) **Security Transition Program Office; progress report.** Nouson, P.A. Department of Energy, Richland, WA (United States). Richland Operations Office. Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). (PNL–10132). Order Number DE95001852. Source: OSTI; NTIS; GPO Dep.

This report documents the progress made by the Hanford security transition in which the Security Transition Program Office (STPO) has participated since its inception on September 9, 1992. The STPO was organized as a short-lived (two year) program office, targeted at a special goal, the significant change in operations of safeguards and security through process improvement. Comprised of a team from the Department of Energy Richland Operations Office (RL) and the Hanford contractors, the security transition began with a vision to change the Hanford Safeguards and Security program from a large paramilitary organization that supported the national defense mission to an industrial-style organization that supports environmental cleanup. The industrial security foundation continues to be supplemented to protect material interests and information resources requiring critical asset protection.

549 (DOE/RL–94-124) **Security Transition Program Office (STPO), technology transfer of the STPO process, tools, and techniques.** Hauth, J.T.; Forslund, C.R.J.; Underwood, J.A. US-DOE Richland Operations Office, WA (United States). Sep 1994. 91p. Sponsored by USDOE, Washington, DC (United States). (PNL–10192). Order Number DE95002584. Source: OSTI; NTIS; GPO Dep.

In 1990, with the transition from a defense mission to environmental restoration, the U.S. Department of Energy's (DOE's) Hanford Site began a significant effort to diagnose, redesign, and implement new safeguards and security (SAS) processes. In 1992 the Security Transition Program Office (STPO) was formed to address the sweeping changes that were being identified. Comprised of SAS and other contractor staff with extensive experience and supported by staff experienced in organizational analysis and work process redesign, STPO undertook a series of tasks designed to make fundamental changes to SAS processes throughout the Hanford Site. The goal of STPO is to align the SAS work and organization with the new Site mission. This report describes the key strategy, tools, methods, and techniques used by STPO to change SAS processes at Hanford. A particular focus of this review is transferring STPO's experience to other DOE sites and federal agency efforts: that is, to extract, analyze, and provide a critical review of the approach, tools, and techniques used by STPO that will be useful to other DOE sites and national laboratories in transitioning from a defense production mode to environmental restoration and other missions. In particular, what lessons does STPO provide as a pilot study or model for implementing change in other transition activities throughout the DOE complex? More broadly, what theoretical and practical contributions do DOE transition efforts, such as STPO, provide to federal agency streamlining efforts and attempts to "reinvent" government enterprises in the public sector? The approach used by STPO should provide valuable information to those examining their own processes in light of new mission requirements.

550 (IAEA-INFCIRC–209(rev.1/add.3)) **Communications received from Members regarding the export of nuclear material and of certain categories of equipment and other material.** International Atomic Energy Agency, Vienna (Austria). Apr 1994. 12p. (In Arabic, Chinese, English, French, Russian, Order Number DE95604201. Source: OSTI; NTIS (US Sales Only); INIS.

The Director General has received a letter dated 7 October 1993 from the Permanent Mission of Bulgaria, letters dated 8 October 1993 from the Permanent Missions of Australia, Austria, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Japan, Luxembourg, the Netherlands, Norway, Portugal, the Russian Federation, Spain, Sweden, the United Kingdom of Great Britain and Northern Ireland, the United States of America, and a letter dated 11 October 1993 from the Permanent Mission of Poland to the International Atomic Energy Agency concerning the export of nuclear material and of certain categories of equipment and other material. Text of the letter is presented.

551 (IAEA-INFCIRC–443) **Communication dated 3 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 18 May 1994. 19p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605216. Source: OSTI; NTIS (US Sales Only); INIS.

The text of an Interview by a Spokesman of the Foreign Ministry of the Democratic People's Republic of Korea concerning the replacement of fuel rods at the 5-Megawatt Experimental Nuclear Power Station, dated 3 May 1994, is being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea.

552 (IAEA-INFCIRC–444) **Communication dated 14 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 30 May 1994. 23p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605217. Source: OSTI; NTIS (US Sales Only); INIS.

The text of an Interview by a Spokesman of the Foreign Ministry of the Democratic People's Republic of Korea, dated 14 May 1994, is being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea.

553 (IAEA-INFCIRC–446) **Communications dated 27 and 28 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 6 Jun 1994. 35p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605215. Source: OSTI; NTIS (US Sales Only); INIS.

The texts of the communications received from the Permanent Mission of the Democratic People's Republic of Korea are being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea: Document presented by the DPRK Delegation to the IAEA Delegation at their Working-Level Consultation on 27 may 1994 (Attachment 1); interview by a Spokesman of the Foreign Ministry of the Democratic People's Republic of Korea of 28 May 1994 (Attachment 2).

554 (INIS-JP–024, pp. B420/1-B420/11) **Application to plutonium and uranium in safeguards.** Akiba, Mitsunori (Power Reactor and Nuclear Fuel Development Corp., Tokyo (Japan)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268– : 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

A isotope dilution gamma spectrometry, a K-edge densitometer etc. to measure plutonium content are developed at Tokai Reprocessing Plant. At the Plutonium Fuel Production Facility, NDA instruments have been developed and installed to be accommodated in the automated transfer system. These systems are PCAS (for measurement of canisters), FAAS (for measurement of fuel assemblies), FPAS (for measurement of fuel pins) and MAGB (for measurement of material accountancy glove box). All of detectors used in these systems are based on passive neutron coincidence counting of the ^{240}Pu-effective mass using ^{3}He counters. The plutonium isotopic ratios are obtained by mass spectroscopy and/or gamma-ray spectroscopy. Nuclear material flow monitors are developed and installed at Joyo and Monju reactors, for the purpose of containment and surveillance. For the measurement of uranium, extensive developments of NDA have been carried out at the Ningyo Toge uranium enrichment facility. A uranium enrichment monitor on

cascade header pipes to verify that the enrichment of uranium is within the high enriched has been successfully developed. Enrichment measurement systems for a 30B cylinder and a sample bottle were also developed. These systems are mainly due to measuring 186 kev γ ray emitted from ^{235}U isotope. Most of NDA systems are now in routine use by the NSB and IAEA inspectors. (J.P.N.).

555 (INIS-JP–024, pp. B432/1-B432/9) **Measurement technique of radwaste content: For TRU.** Ohya, Akio (Mitsubishi Atomic Power Industries, Inc., Omiya, Saitama (Japan). Omiya Technical Inst.). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Non-destructive assay is effective for management and disposal of transuranium (TRU)-contaminated wastes. Several measurement techniques have been developed such as: (a) Passive γ-ray technique; TRU nuclides emit specific γ-ray. TRU content could be analyzed by γ-ray energy spectroscopy. (b) Passive neutron technique; Alpha-particle emitted from TRU reacts with light elements and generates neutron. Some TRU also generate spontaneous fission neutrons. TRU content could be evaluated by the neutron counting. (c) Active neutron technique; Some TRU are fissionable and generate fission neutrons when exposed to an external neutron source. The TRU content could be evaluated by the fission neutron counting. An active neutron technique which is expected to be highly responsive has been tested in Mitsubishi to measure the TRU content in 200-liter waste drum. The apparatus consists of graphite assay chamber, pulsed-neutron generator, He-3 neutron counters and data acquisition system. The drum is irradiated by periodical neutron burst. The fast neutrons generated from the TRU are counted during the bursts. The counts would be proportional to the TRU content. The results for various waste drums show marked dependency of neutron response on the composition of the waste matrices. The detectable limit is about 2 mg of the fissile TRU for low density matrix and about 20 mg for high density matrix. The limit could be improved by increasing the counters and attainable to about 10 mg of the fissile TRU for high density matrix. However, the active neutron technique is applicable only to fissile TRU and is affected also by the waste matrices. Total TRU content could be evaluated by a combination of informations on TRU isotopic composition and waste matrix properties. (author).

556 (KCP–613-5425) **Bar-code automated waste tracking system.** Hull, T.E. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Oct 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95001498. Source: OSTI; NTIS; INIS; GPO Dep.

The Bar-Code Automated Waste Tracking System was designed to be a site-Specific program with a general purpose application for transportability to other facilities. The system is user-friendly, totally automated, and incorporates the use of a drive-up window that is close to the areas dealing in container preparation, delivery, pickup, and disposal. The system features "stop-and-go" operation rather than a long, tedious, error-prone manual entry. The system is designed for automation but allows operators to concentrate on proper handling of waste while maintaining manual entry of data as a backup. A large wall plaque filled with bar-code labels is used to input specific details about any movement of waste.

557 (LA–12816-PR) **Safeguards and Security Research and Development progress report, October 1992–September 1993.** Smith, D.B.; Jaramillo, G.R. (comps.). Los Alamos National Lab., NM (United States). Oct 1994. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95003018. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the activities carried out by the Los Alamos Safeguards and Security Research and Development program. Part 1 covers the three project phases that are part of the development of the technology essential to continuing improvements in the practice of safeguards and security. Examples include advanced portal monitor technology, digital image analysis for materials control, neutron multiplicity counting techniques, and development of a tomographic gamma-ray scanner. It treats activities aimed at developing methods for designing and evaluating safeguards systems, with special emphasis on the integration of the several subsystems into a real safeguards system. Part 2 covers international safeguards activities, including technology developed for direct application in the international community, support to the IAEA, and bilateral technical exchanges with many other States, such as Argentina, Brazil, China, France, Japan, Russia, and the Ukraine. Part 3 highlights a variety of projects, including several in computer security R and D, direct support of the IAEA through the Program of Technical Assistance to IAEA Safeguards, and safeguards projects funded by the US Department of State, the DOE's Office of Technology Development, the US Nuclear Regulatory Commission, Japan, and Germany. A few examples of these projects are the support to the Westinghouse Hanford Company efforts in data acquisition and control for the hydrogen mitigation tests on high-level-waste Tank 101-SY, nondestructive assay development for Warhead Dismantlement, and instrumentation system development for the Siemans mixed-oxide fuel fabrication plant in Germany. 75 refs.

558 (LA-UR–94-2082) **Determining information management needs for enhanced international safeguards.** Badalamente, R.V. (Pacific Northwest Lab., Richland, WA (United States)); DeLand, S.M.; Whiteson, R.; Anzelon, G. Los Alamos National Lab., NM (United States); Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ; AC04-94AL85000. (SAND–94-1910C; CONF-940748–35: Institute of Nuclear Materials Management annual meeting, Naples, FL (United States), 17-20 Jul 1994). Order Number DE94015787. Source: OSTI; NTIS; GPO Dep.

The Safeguards Information Management System initiative is a program of the Department of Energy's (DOE) Office of Arms Control and Nonproliferation aimed at supporting the International Atomic Energy Agency's (IAEA) efforts to strengthen safeguards through the enhancement of information management capabilities. The DOE hopes to provide the IAEA with the ability to correlate and analyze data from existing and new sources of information, including publicly available information, information on imports and exports, design information, environmental monitoring data, and non-safeguards information. The first step in this effort is to identify and define IAEA requirements. In support of this, we have created a users' requirements document based on interviews with IAEA staff that describes the information management needs of the end user projected by the IAEA, including needs for storage, retrieval, analysis, communication, and visualization of data. Also included are characteristics of the end user and attributes of the current environment. This paper describes our efforts to obtain the required information. We discuss how to accurately represent user needs and involve users for an international organization with a multicultural user population. We describe our approach, our experience in setting up and conducting the interviews and brainstorming sessions, and a brief discussion of what we learned.

559 (RFP–4883) **Performance report for a small package counter that uses active neutron interrogation.** Harlan, R.A.; Wishard, B.E.; Santopietro, R.D.; Anderson, B.P. EG and G Rocky Flats, Inc., Golden, CO (United States). 7 Jul 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE95001690. Source: OSTI; NTIS; INIS; GPO Dep.

An active neutron interrogation system utilizing the differential die-away technique (DDT), was built to assay fissile material in small waste packages for a variety of matrices. Within minutes the system can make a "go/no-go" decision for sorting low-level waste (LLW) from transuranic waste (TRUW). It can also provide gram-level accountability of weapons-grade (WG) Pu in TRUW providing lumps of self-shielding fissile material are absent.

560 (SAND–94-1881C) **Safeguards equipment of the future integrated monitoring systems and remote monitoring.** Sonnier, C.S.; Johnson, C.S. Sandia National Labs., Albuquerque,

NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940748–31: Institute of Nuclear Materials Management annual meeting, Naples, FL (United States), 17-20 Jul 1994). Order Number DE94015785. Source: OSTI; NTIS; INIS; GPO Dep.

Becoming aware of the significant events of the past four years and their effect on the expectations to international safeguards, it is necessary to reflect on which direction the development of nuclear safeguards in a new era needs to take and the implications. The lime proven monitoring techniques, based on quantitative factor's and demonstrated universal application, have shown their merit. However, the new expectations suggest a possibility that a future IAEA safeguards system could rely more heavily on the value of a comprehensive, transparent and open implementation regime. Within such a regime, the associated measures need to be determined and technological support identified. This paper will identify the proven techniques which, with appropriate implementation support, could most quickly make available additional measures for a comprehensive, transparent and open implementation regime. In particular, it will examine the future of Integrated Monitoring Systems and Remote Monitoring in international safeguards, including technical and other related factors.

561 (SAND–94-2570C) **The International Remote Monitoring Project and implications.** Sonnier, C.S.; Johnson, C.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410232–1: Materials Research Society meeting, Tokyo (Japan), 24-25 Oct 1994). Order Number DE95001523. Source: OSTI; NTIS; GPO Dep.

Becoming aware of the significant changes of the past several years and their effect on the expectations to international safeguards, it is necessary to reflect on which direction the development of nuclear safeguards in a new era needs to take. The time-proven monitoring techniques, based on quantitative factors and demonstrated universal application, have shown their merit. However, the new expectations suggest a possibility that a future IAEA safeguards, system could rely more heavily on the value of a comprehensive, transparent, and open implementation regime. Within such a regime, the associated measures need to be determined and technological support identified. This paper will identify proven techniques which, with appropriate implementation support, could most quickly make available additional measures for a comprehensive, transparent and open implementation regime. In particular, it will examine the future of remote monitoring in International Safeguards, and provide an update on the International Remote Monitoring Project and related implications.

562 (UCRL-ID–106454-94-3) **Lawrence Livermore National Laboratory safeguards and security quarterly progress report to the U.S. Department of Energy: Quarter ending June 30, 1994.** Davis, G.; Mansur, D.L.; Ruhter, W.D.; Steele, E.; Strait, R.S. Lawrence Livermore National Lab., CA (United States). Aug 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95001464. Source: OSTI; NTIS; GPO Dep.

The Lawrence Livermore National Laboratory (LLNL) carries out safeguards and security activities for the Department of Energy (DOE), Office of Safeguards and Security (OSS), as well as other organizations, both within and outside the DOE. At present, the Laboratory is supporting OSS in five areas: safeguards technology; safeguards and decision support; computer security; DOE automated physical security; and DOE automated visitor access control system. The remainder of this report describes the activities in each of these five areas. The information provided includes an introduction which briefly describes the activity, summary of major accomplishments, task descriptions with quarterly progress, summaries of milestones and deliverables and publications published this quarter.

563 (WHC-SD-CP-RPT–014) **Plutonium and tritium produced in the Hanford Site production reactors.** Roblyer, S.P. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001835. Source: OSTI; NTIS; INIS; GPO Dep.

In a news release on December 7, 1993, the Secretary of Energy announced declassification action that included totals for plutonium and tritium production in the Hanford Site production reactors. This information was reported as being preliminary because it was not fully supported by documentation. Subsequently, production data were made available from the US Department of Energy-Headquarters (DOE-HQ) records that indicated an increase of about one and one-half metric tons in total plutonium production. The Westinghouse Hanford Company was tasked by the US Department of Energy-Richland Operations Office to substantiate production figures and DOE-HQ data and to provide a defensible report of weapons- (6 wt% ^{240}Pu) and nonweapons- (fuels-)grade (nominally 9 wt% or higher ^{240}Pu) plutonium and tritium production in the Hanford Site production reactors. The task was divided into three parts. The first part was to determine plutonium and tritium production based on available reported accountability records. The second part was to determine plutonium production independently by calculational checks based on reactor thermal power generation and plutonium conversion factors representing the various reactor fuels. The third part was to resolve differences, if they occurred, in the reported and calculational results. In summary, the DOE-HQ-reported accountability records of plutonium and tritium production were determined to be the most defensible record of Hanford Site reactor production. The DOE-HQ records were consistently supported by the independent calculational checks and the records of operational data. Total production quantities are 67.4 MT total plutonium, which includes 12.9 MT of nonweapons-grade plutonium. The total tritium production was 10.6 kg.

564 (WHC-SD-SNF-ATP–002) **Conversion to Paradox 4.02 ATP's for MAC and mass balance programs.** Russell, V.K. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002150. Source: OSTI; NTIS; GPO Dep.

The K Basins Materials Accounting (MAC) and Material Balance (MBA) database system were converted from Paradox 3.5 to Paradox 4.0. The ATP describes how the code was to be tested to verify its corrections.

565 (WHC-SD-SNF-ATP–003) **Paradox applications integration ATP's for MAC and mass balance programs.** Russell, V.K.; Mullaney, J.E. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002153. Source: OSTI; NTIS; INIS; GPO Dep.

The K Basins Materials Accounting (MAC) and Material Balance (MBA) database system were set up to run under one common applications program. This Acceptance Test Plan (ATP) describes how the code was to be tested to verify its correctness. The scope of the tests is minimal, since both MAC and MBA have already been tested in detail as stand-alone programs.

566 (WHC-SD-SNF-TP–005) **MBA acceptance test procedures, software Version 1.4.** Mullaney, J.E.; Russell, V.K. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002151. Source: OSTI; NTIS; INIS; GPO Dep.

The Mass Balance Program (MBA) is an adjunct to the Materials Accounting database system, Version 3.4. MBA was written to equip the personnel performing K-Basin encapsulation tasks with a conservative estimate of accumulated sludge during the processing of canisters into and out of the chute. The K Basins Materials Balance programs had some minor improvements made to it to feedback the chute processing status to the operator better. This ATP describes how the code was to be tested to verify its correctness.

0560 Legislation and Regulations

Refer also to citation(s) 187, 225, 553, 794, 2578

567 (DOE/LLW–206) **Model tracking system for low-level radioactive waste disposal facilities: License application interrogatories and responses.** Benbennick, M.E.; Broton, M.S.;

Fuoto, J.S.; Novgrod, R.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94058). Order Number DE95002013. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a model tracking system for a low-level radioactive waste (LLW) disposal facility license application. In particular, the model tracks interrogatories (questions, requests for information, comments) and responses. A set of requirements and desired features for the model tracking system was developed, including required structure and computer screens. Nine tracking systems were then reviewed against the model system requirements and only two were found to meet all requirements. Using Kepner-Tregoe decision analysis, a model tracking system was selected.

568 (IAEA-INFCIRC–254(rev.1/pt.1/Mod.1/.1)) **Communications received from certain Member States regarding guidelines for the export of nuclear material, equipment and technology.** International Atomic Energy Agency, Vienna (Austria). Apr 1994. 18p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605202. Source: OSTI; NTIS (US Sales Only); INIS.

The Director General has received notes verbales dated 27 August 1993 and 28 October 1993 from the Permanent Missions of Finland and Spain to the International Atomic Energy relating to the export of nuclear material, equipment and technology. The purpose of these notes verbales is to provide further information on those Governments' nuclear export policies and practices.

569 (IAEA-INFCIRC–254(rev.1/pt.1/mod.2)) **Communications received from Member States regarding guidelines for the export of nuclear material, equipment and technology.** International Atomic Energy Agency, Vienna (Austria). Apr 1994. 222p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605203. Source: OSTI; NTIS (US Sales Only); INIS.

The Director General has received notes verbales to the export of nuclear material, equipment and technology from the following Permanent Missions to the International Atomic Energy Agency: notes verbales dated 1 March 1994 from the Permanent Missions of Australia, Austria, Belgium, Bulgaria, Canada, the Czech Republic, Denmark, Finland, France, Germany, Hungary, Italy, Japan, the Netherlands, Poland, Portugal, Spain, Sweden, Switzerland, the United Kingdom of Great Britain and Northern Ireland, the United States of America; and a note verbale dated 12 March 1994 from the Permanent Mission of Romania. The purpose of these notes verbales is to provide further information on these Governments' nuclear export policies and practices.

570 (IAEA-INFCIRC–433) **Agreement with the Government of India for the application of safeguards to all nuclear material subject to Agency safeguards under INFCIRC/154, Part 1 and under the Agreements between India and the IAEA contained in exchanges of letters dated 1 October and 1 December 1993.** International Atomic Energy Agency, Vienna (Austria). May 1993. 92p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605204. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Exchange of Letters and the Attachment, constituting the Agreement with the Government of India for the Application of Safeguards to all nuclear material subject to Agency safeguards under INFCIRC/154, Part 1, and under the Agreements between India and the IAEA contained in Exchanges of Letters dated 1 October and 1 December 1993, is reproduced in this document for the information of all Members. The Agreement was approved by the Agency's Board of Governors on 21 February 1994. The Agreement entered into force, pursuant to the Exchange of Letters, on 1 March 1994.

571 (IAEA-INFCIRC–438) **Communication dated 24 March 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 14 Apr 1994. 24p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605205. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Statement by a Spokesman of the General Department of Atomic Energy of the Democratic People's Republic of Korea dated 24 March 1994 is being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea.

572 (IAEA-INFCIRC–440) **Communication dated 4 April 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 14 Apr 1994. 23p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605206. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the Statement by the Spokesman for the Ministry of Foreign Affairs of the Democratic People's Republic of Korea dated 4 April 1994 is being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea.

573 (IAEA-INFCIRC–441) **Communication dated 10 March 1994 received from the Permanent Mission of the Federal Republic of Yugoslavia (Serbia and Montenegro).** International Atomic Energy Agency, Vienna (Austria). 19 Apr 1994. 12p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605207. Source: OSTI; NTIS (US Sales Only); INIS.

The text of the aide memoire, dated 10 March 1994, of the Permanent Mission of the Federal Republic of Yugoslavia (Serbia and Montenegro) to the IAEA is being circulated for the information of all Member States at the request of the Alternate Resident Representative of the Federal Republic of Yugoslavia (Serbia and Montenegro).

574 (IAEA-INFCIRC–442) **Communication dated 20 April 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 9 May 1994. 79p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605208. Source: OSTI; NTIS (US Sales Only); INIS.

The text of a Memorandum of the Foreign Ministry of the Democratic People's Republic of Korea dated 20 April 1994 is being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea.

575 (IAEA-INFCIRC–450) **Statement dated 1 June 1994 by a spokesman for the Foreign Ministry of the Democratic People's Republic of Korea.** International Atomic Energy Agency, Vienna (Austria). 13 Jul 1994. 31p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605210. Source: OSTI; NTIS (US Sales Only); INIS.

The attached text of a statement by a spokesman for the Foreign Ministry of the Democratic People's Republic of Korea, dated 1 June 1994, is being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea. This text was received by the Secretariat before the withdrawal of the Democratic People's Republic of Korea from the Agency.

576 (IAEA-INFCIRC–451) **Communications dated 2 and 6 June 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency.** International Atomic Energy Agency, Vienna (Austria). 13 Jul 1994. 42p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605211. Source: OSTI; NTIS (US Sales Only); INIS.

The texts of two telex communications, dated 2 and 6 June 1994, which the International Atomic Energy Agency received from the General Department of Atomic Energy of the Democratic People's Republic of Korea are being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea. These texts were received by the Secretariat before the withdrawal of the Democratic People's Republic of Korea from the Agency.

577 (IAEA-INFCIRC–452) **Communication dated 3 June 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy**

Agency. International Atomic Energy Agency, Vienna (Austria). 13 Jul 1994. 42p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605212. Source: OSTI; NTIS (US Sales Only); INIS.

The texts of an Interview by a Spokesman for the General Department of Atomic Energy of the Democratic People's Republic of Korea, dated 3 June 1994, and Relevant Information, are being circulated to all Member States of the Agency at the request of the Permanent Mission of the Democratic People's Republic of Korea. These texts were received by the Secretariat before the withdrawal of the Democratic People's Republic of Korea from the Agency.

578 (INIS-mf–14313, pp. 459-473) **Authorization and licensing of nuclear research reactor operating personnel.** Mohammed, F.A. Arab Atomic Energy Agency (AAEA), Tunis (Tunisia); Atomic Energy Establishment, Cairo (Egypt). 1993. 766p. (CONF-9309380–: A seminar on physics and technology of nuclear reactors, Cairo (Egypt), 11 Sep 1993). In *Proceedings of the symposium on the physics and technology of reactors.* Order Number DE95603392. Source: OSTI; NTIS (US Sales Only); INIS.

Control over nuclear safety is maintained primarily through governmental licences that authorize the development of the research reactor project from each stage to the next. Thus, the regulatory body determines whether the application for a licence on the basis of review and assessment. The licensing process differs among different countries depending on their own regulations and considerations for reactor safety. But, the major stages of the licensing process shall encompass the regulation of: * Siting * Design and construction * Commissioning * Operation * Decommissioning Thus, the licensing process should be considered as an on going process, starting at the site planning stage and continuing up to and including decommissioning of the reactor facility. One of the most important of facility licensing is the operating personnel licensing which is the subject of that lecture.

579 (PNL–6415-Rev.6) **Hanford Site National Environmental Policy Act (NEPA) characterization: Revision 6.** Cushing, C.E. (ed.) (and others); Baker, D.A.; Chamness, M.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 235p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018726. Source: OSTI; NTIS; INIS; GPO Dep.

This sixth revision of the Hanford Site National Environmental Policy (NEPA) Characterization presents current environmental data regarding the Hanford Site and its immediate environs. This information is intended for use in preparing Site-related NEPA documentation. Chapter 4.0 summarizes up-to-date information on climate and meteorology, geology and hydrology, ecology, history and archaeology, socioeconomics, land use, and noise levels prepared by Pacific Northwest Laboratory (PNL) staff. More detailed data are available from reference sources cited or from the authors; Chapter 5.0 has been significantly updated from the fifth revision. It describes models, including their principal underlying assumptions, that are to be used in simulating realized or potential impacts from nuclear materials at the Hanford Site. Included are models of radionuclide transport in groundwater and atmospheric pathways, and of radiation dose to populations via all known pathways from known initial conditions; The updated Chapter 6.0 provides the preparer with the federal and state regulations, DOE orders and permits, and environmental standards directly applicable to the NEPA documents on the Hanford Site, following the structure of Chapter 4.0. No conclusions or recommendations are given in this report. Rather, it is a compilation of information on the Hanford Site environment that can be utilized directly by Site contractors. This information can also be used by any interested individual seeking baseline data on the Hanford Site and its past activities by which to evaluate projected activities and their impacts.

07 ISOTOPE AND RADIATION SOURCE TECHNOLOGY

0701 Physical Isotope Separation

580 (INIS-JP–024, pp. B550/1-B550/11) **Production and supply of radioisotopes with high-energy particle accelerators current status and future directions.** Srivastava, S.C. (Brookhaven National Lab., Upton, NY (United States)); Mausner, L.F. Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Although the production of radioisotopes in reactors or in low to medium energy cyclotrons appears to be relatively well established, certain isotopes can either be made only in high-energy particle accelerators or their production is more cost effective when made this way. These facilities are extremely expensive to build and operate, and isotope production is, in general, either not cost-effective or is in conflict with their primary mandate or missions which involve physics research. Isotope production using high-energy accelerators in the U.S., therefore, has been only an intermittent and parasitic activity. However, since a number of isotopes produced at higher energies are emerging as being potentially useful for medical and other applications, there is a renewed concern about their availability in a continuous and reliable fashion. In the U.S., in particular, the various aspects of the production and availability of radioisotopes from high-energy accelerators are presently undergoing a detailed scrutiny and review by various scientific and professional organizations as well as the Government. A number of new factors has complicated the supply/demand equation. These include considerations of cost versus needs, reliability factors, mission orientation, research and educational components, and commercial viability. This paper will focus on the present status and projected needs of radioisotope production with high-energy accelerators in the U.S., and will compare and examine the existing infrastructure in other countries for this purpose. The nature of the U.S. decisions to address many of the above-mentioned issues and an eventual plan of attack to resolve them are bound to have a world-wide impact in the radioisotope user communities. These will be discussed with a view to evaluating the best possible solutions in order to eliminate the shortage in the future supply of radioisotopes produced in high energy accelerators. (author).

0702 Radiation Sources

Refer also to citation(s) 1380, 1418, 1484, 1485, 1550, 1551, 1884

581 (INIS-JP–024, pp. A640/1-A640/10) **Application of X-ray radiography to archaeology.** Miura, Sadatoshi (Tokyo National Research Inst. of Cultural Properties, Tokyo (Japan)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

X-ray imaging techniques including radiography and scanning tomography are now often applied to archaeological and historical objects. In this report results of three imaging techniques are showed: radiography, X-ray scanning tomography and emissiography. X-ray radiography was applied to examine the technique used for a bronze object. The object was one of the national treasure from Horyuji-temple, Dragon-head Pitcher. The examination proved that the pitcher body was separated into three pieces and that the bronze was fairly homogeneous from 3 to 4 mm. The Pitcher was supposed to be made in Japan at the middle of the seventh century. A small gilt bronze statuette was investigated by an industrial

X-ray scanner. The statuette about 30 cm high is supposed to be made in the seventh or eighth century. The head of the statuette was scanned by X-rays of 350kV. The computed tomograms revealed an inlaid metal and scraped hollow. It is supposed that the statuette was cast twice. The first casting might have failed causing the hollow and the missing part of the head. The hollow was scraped before the following casting so that the newly cast part would be tightly joined to the body. A piece of metal was inlaid to the missing part. A silver inlaid sword was excavated at a historic site called Etafunayama Kofun in Kumamoto in 1873. Seventy-five letters were discovered on the back of the sword, and they were regarded as important reference in studying Japanese history around the fifth century. However, the letters became illegible because of severe surface corrosion. So emissiography or electron radiography was used. All letters and even the details could be read. (author).

582 (INIS-mf–14340, pp. 337-351) **Radiation vulcanization of natural rubber latex using N-butyl acrylate and carbon tetrachloride as sensitizer.** Siri-Upathum, C. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology). Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

To decrease the amount of 2-ethyl hexyl acrylate (2-EHA) residue in rubber products from radiation vulcanized natural rubber latex (RVNRL) using 2-EHA as sensitizer, n-butyl acrylate (n-Ba) which has higher vapor pressure than 2-EHA was used with CCl_4 in place of 2-EHA as sensitizer. Experimental results showed that when n-BA alone was used as sensitizer, vulcanization dose was found to be greater than 30 kGy. N-BA residue remained in rubber product was found also to be relatively high. Mixture of n-Ba and CCl_4, however when used as sensitizer, vulcanization dose found to be low, as low as 17 kGy with 5 and 0.5 phr of n-BA and CCl_4 respectively. The acrylate residue in this case was found also to be very low, as low as 1-2 ppm only.

583 (INIS-mf–14340, pp. 352-362) **The use of Au-198 in evaluation of current efficiency in commercial aluminium reduction cell.** Wiblin, W. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia)); Stretch, D.; Tariq, Jamil A.; Joon Ha Jin; Thamthari, P. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

A method of calculation of the metal inventory in commercial aluminium reduction cell, based on radioisotope dilution method, has been used for a one-pot trial at the New Zealand Aluminium Smelter (NZAS) plant, using Au-198 tracer. The trial found that the method is a safe and quick way to estimate the current efficiency with an error of 1%.

584 (INIS-mf–14340, pp. 432-441) **Standardization in beta dosimetry.** Wanitsuksombut, W.; Thongmitr, W.; Soodprasert, T.; Udomsomporn, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Reference radiations in the Secondary Standard Dosimetry Laboratory, OAEP, have been improved and modified by employing lead attenuators. To identify low-level exposure rate, shadow-cone method has been applied. The secondary standard dosemeter has been used periodically to check the constancy of reference radiations to assure the calibration of dosemeters and dose ratemeters used for radiation protection.

585 (INIS-mf–14340, pp. 442-449) **Radiation monitor calibration technique.** Soodprasert, T.; Lumjiactas, S.; Wanitsuksombut, W.; Thongmitr, W. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Reference radiations in the Secondary Standard Dosimetry Laboratory, OAEP have been improved and modified by employing lead attenuators. To identify low-level exposure rate, shadow-cone method has been applied. The secondary standard dosemeter has been used periodically to check the constancy of reference radiations to assure the calibration of dosemeters and dose-ratemeters used for radiation protection.

586 (INIS-mf–14374) **Test trial radiation vulcanization of natural rubber latex in Jakarta Indonesia.** Devendra, R. (Ceylon Institute of Scientific and Industrial Research (Sri Lanka)); Kulatunge, S.S.; Chandralal, H.N.K.K.; Kalyani, N.M.V.; Seneviratne, J.; Wellage, S. Ceylon Inst. of Scientific and Industrial Research, Colombo (Sri Lanka). 29 Sep 1994. 31p. Order Number DE95603802. Source: OSTI; NTIS (US Sales Only); INIS.

Radiation vulcanization of natural rubber latex (RVNRL) can be used to make large quantities of specially stabilized latex. It is possible to obtain RVNRL films of tensile strength over 25 MPa. The films could be either coagulant dipped or cast. It is very important to determine the correct radiation dose which gives the maximum tensile strength. Cross linking density or prevulcanized relax modulus (PRM) at 100% is a reliable property to control the prevulcanization.

587 (INIS-mf–14392) **Nuclear energy and natural environment. Information seminar.** National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). Order Number DE95605953. Source: OSTI; NTIS; INIS.

The material of the Jadwisin 93' seminar is the collection 20 of 19 articles discussing aspects of the subject of nuclear energy and natural environment. The lectures were presented at six sessions: (1) Nuclear energy applications in medicine, agriculture, industry, food preservation and protection of the environment; (2) Nuclear power in the world; (3) Public attitudes towards different energy options, the example of Sweden; (4) Nuclear power in neighbouring countries; (5) Radiation and human health; (6) Radioactive waste management and potential serious radiological hazards. The general conclusion of the seminar can be as follows. In some cases the nuclear power is a source of environment pollution but very often nuclear techniques are now used and certainly more often in the future will be used for environment and human health protection.

588 (INIS-mf–14392, pp. 31-40) **Application of isotopes and radiation for industry and environmental protection.** Machi, S. (International Atomic Energy Agency, Vienna (Austria)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The novel nuclear energy applications in medicine, agriculture, industry, food preservation and environment protection have been reviewed and discussed. As an example the statistics of radioisotope and radiation facilities in Japan has been shown. Totally about 8000 radiation and isotope facilities have been working in Japan in 1993. 4 figs, 2 tabs.

589 (INIS-mf–14392, pp. 45-46) **Nuclear technology in hydrological and environmental research.** Florkowski, T. (Institute of Physics and Nuclear Techniques, Cracow (Poland)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The nuclear technology applications for investigation of hydrological, hydrogeological, meteorological, paleoclimatological and environmental problems has been described. The study of changes in natural isotopes composition ratios due to their fractional can answer many problems concerning hydrological cycle, origin and age of surface and underground waters, their movement, mixing etc. It

has been also shown applications of nuclear technology to research the atmosphere pollution.

590 (INIS-mf–14392, pp. 47-55) **Radiation technologies and nuclear techniques friendly to man and environment.** Chmielewski, A.G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Walis, L. National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The activity of Polish institutions in the study of radiation technologies and nuclear techniques has been shown and discussed. Some of them have already been successfully finished. In this group the next ones has been mentioned: polyolefins thermo shrinkable products with "memory of shape" (INCT), fast thyristors manufacturing (INCT), radiation sterilization (INCT and IITR), radiation resistant polypropylene (INCT), hydrogel dressing (IITR), radiometric gages for air protection (INCT), radiotracers methods for help to keep technologies clean and safe (INCT). Some of the technologies are still under investigation. In this group technologies utilizing electron beam to: remove SO_2 and NO_x from flue gases, disinfection of sediments from biological sewage treatment plants, disinfection and food preservation can be included.

591 (INIS-mf–14393, pp. 52-53) **The possibility of application of ion chromatography for the determination of nitrogen and sulfur oxides and some other compounds in combustion flue gases after electron beam treatment.** Kulisa, K. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Dybczynski, R.; Polkowska-Motrenko, H. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs., 4 figs. FLUE GAS/ion exchange chromatography; FLUE GAS/irradiation; AMMONIA; COAL; COMBUSTION; ELECTRON BEAMS; IRRADIATION; NITROGEN OXIDES; SULFUR OXIDES

592 (INIS-mf–14393, pp. 69-70) **Investigation of industrial effluent dilution and self-purification in the river.** Owczarczyk, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Szpilowski, S.; Wierzchnicki, R.; Strzelecki, M. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs., 1 fig. TRACER TECHNIQUES/chemical effluents; TRACER TECHNIQUES/environmental transport; BROMINE 82; DIFFUSION; MIXING; RIVERS; TURBULENCE

593 (INIS-mf–14393, pp. 70-71) **Application of tracer method for selection of optimal location of industrial effluent outfall into the river.** Szpilowski, S. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Owczarczyk, A.; Wierzchnicki, R. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 3 figs. TRACER TECHNIQUES/chemical effluents; TRACER TECHNIQUES/environmental transport; BROMINE 82; DIFFUSION; MIXING; OPTIMIZATION; RIVERS; TURBULENCE; WATER POLLUTION

594 (INIS-mf–14393, pp. 73) **Radiotracer investigation of the six-drawing machine glass furnace for flat glass production.** Harasimowicz, M. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Palige, J.; Chmielewski, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 figs. TRACER TECHNIQUES/dynamic function studies; TRACER TECHNIQUES/technology assessment; GLASS; MATHEMATICAL MODELS

595 (INIS-mf–14393, pp. 73-74) **The dynamics of extraction column.** Chmielewski, A.G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Dobrowolski, A.; Palige, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 2 figs., 1 tab. TRACER TECHNIQUES/dynamic function studies; TRACER TECHNIQUES/extraction columns; BENCH-SCALE EXPERIMENTS; MATHEMATICAL MODELS; TEST FACILITIES

596 (INIS-mf–14393, pp. 77-78) **The effects of new fuel additives on carbon deposition and wear of combustion engines.** Zukowska-Cwik, G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Kras, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 tab. TRACER TECHNIQUES/fuel additives; TRACER TECHNIQUES/wear resistance; COBALT 60; SPARK IGNITION ENGINES; TRIBOLOGY

597 (INIS-mf–14393, pp. 81) **A method of gallium purification from arsenic, bismuth, cadmium and iron by gallium remelting under synthetic slags.** Rowinska, L. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Nowicki, A.; Walis, L. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs. TRACER TECHNIQUES/gallium; TRACER TECHNIQUES/impurities; TRACER TECHNIQUES/zone melting; ARSENIC; AUTORADIOGRAPHY; BISMUTH; CADMIUM; IRON; PURIFICATION; GALLIUM; IMPURITIES

598 (INIS-mf–14393, pp. 94-95) **Some properties of foils and PTM made of different polymers irradiated by electrons.** Buczkowski, M. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Fiderkiewicz, A.; Zhitariuk, N.I.; Orelovich, O.L.; Soboleva, T. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 4 figs. FOILS/irradiation; FOILS/surface properties; MEMBRANES/irradiation; MEMBRANES/surface properties; ELECTRON BEAMS; ELECTRON MICROSCOPY; FOILS; IRRADIATION; FRACTURES; MEMBRANES; PARTICLE TRACKS; POLYCARBONATES; POLYPROPYLENE

599 (INIS-mf–14393, pp. 95-96) **The pilot plant for electron beam flue gas treatment. Two-stages irradiation test.** Chmielewski, A.G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Iller, E.; Tyminski, B.; Zimek, Z.; Licki, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. State Committee for Sci.Res. Grant 209859101/p01; IAEA Technnica In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs., 2 figs. FLUE GAS/electron beams; FLUE GAS/irradiation; ACCELERATOR FACILITIES; IRRADIATION; NITROGEN OXIDES; REMOVAL; SULFUR DIOXIDE

600 (INIS-mf–14393, pp. 96) **Electron beam induced purification of air by removing the volatile organic compounds.** Palyska, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Chmielewski, A.G.; Zimek, Z. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 fig. FLUE GAS/electron beams; FLUE GAS/irradiation; IRRADIATION; GAS CHROMATOGRAPHY; ORGANIC COMPOUNDS; REMOVAL; VOLATILE MATTER

601 (INIS-mf–14393, pp. 97-98) **The laboratory unit of SO_2 and NO_x removal from flue gases by simultaneous use electron beam and streams of microwave energy.** Zimek, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Chmielewski, A.G.; Iller, E.; Licki, J.; Bulka, S.; Lysov, G.W.; Frank, N.W. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 1 fig., 3 tabs. FLUE GAS/ irradiation; BENCH-SCALE EXPERIMENTS; ELECTRON BEAMS; IRRADIATION; MICROWAVE RADIATION; NITROGEN OXIDES; REMOVAL; SULFUR DIOXIDE

602 (INIS-mf–14393, pp. 102-103) **Isotope gauge and computer program for quality control of thickness coating process.** Zakrzewska, D. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Machaj, B. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 1 fig. THICKNESS GAGES/ computerized control systems; THICKNESS GAGES/quality control; THICKNESS GAGES/surface coating; BETA RADIOGRAPHY; RADIOMETRIC GAGES

603 (INIS-mf–14393, pp. 104) **Industrial gauge of sulphuric acid concentration.** Mirowicz, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 fig., 1 tab. SULFURIC ACID/ densimeters; AUTOMATION; CONTROL SYSTEMS; NEUTRON PROBES; DENSIMETERS

604 (INIS-mf–14393, pp. 105) **Multi-points mobile radiotracer laboratory.** Dziewonski, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Chmielewski, A.G.; Palige, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 fig. COMPUTERIZED CONTROL SYSTEMS/data base management; COMPUTERIZED CONTROL SYSTEMS/data processing; TRACER TECHNIQUES/data acquisition systems; TRACER TECHNIQUES/field tests

605 (INIS-mf–14393, pp. 106) **Isotopic density gauge of ceramic bodies.** Wieclaw, B. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. RADIOMETRIC GAGES/automation; RADIOMETRIC GAGES/densimeters; AMERICIUM 241; CERAMICS INDUSTRY; PORCELAIN; AUTOMATION; DENSIMETERS

606 (KEK-PROC–93-10, pp. 408-410) **Monte Carlo calculation of electron beam dose distribution in water.** Sawamura, Sadashi (Hokkaido Univ., Sapporo (Japan). Faculty of Engineering); Kitaichi, Masatoshi; Fujiwara, Tomoharu; Fujita, Fumiyuki; Sato, Koichi; Tanida, Hiroaki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

EGS4 code is used for Monte Carlo calculations of electron beam doses in order to obtain 3-dimensional distributions in water. It has been shown that the fraction of energy carried out by an escaped electron from the medium gives large affection to the distribution. The results were compared with experimental data obtained by using the pulse radiolysis method. (author).

607 (ORNL/TM–12712) **An examination of the elastic structural response of the Advanced Neutron Source fuel plates.** Swinson, W.F.; Luttrell, C.R.; Yahr, G.T. Oak Ridge National Lab., TN (United States). Sep 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002306. Source: OSTI; NTIS; INIS; GPO Dep.

Procedures for evaluating the elastic structural response of the Advanced Neutron Source (ANS) fuel plates to coolant flow and to temperature variations are presented in this report. Calculations are made that predict the maximum deflection and the maximum stress for a representative plate from the upper and from the lower fuel elements.

0703 Isotopic Power Supplies

608 (DOE/NE/32112–T6) **Modular Radioisotope Thermoelectric Generator (RTG) Program: Final technical report.** General Electric Co., Philadelphia, PA (United States). Astro Space Div. 31 Dec 1992. 513p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-83NE32112. (GESP–7230). Order Number DE94011553. Source: OSTI; NTIS; GPO Dep.

Section 2.0 of this report summarizes the MOD-RTG reference flight design, and Section 3.0 discusses the Ground Demonstration System design. Multicouple technology development is discussed in Section 4.0, and Section 5.0 lists all published technical papers prepared during the course of the contract.

609 (DOE/SF/18852–T44) **GPHS-RTGs in support of the Cassini Mission: Semi annual technical progress report, 28 March 1994–25 September 1994.** Martin Marietta Astro Space, Philadelphia, PA (United States). 20 Oct 1994. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-91SF18852. Order Number DE95001492. Source: OSTI; NTIS; INIS; GPO Dep.

The progress on the radioisotope generators and ancillary activities is described. This report is organized by program task as follows: spacecraft integration and liaison; engineering support; safety; qualified unicouple fabrication; ETG fabrication, assembly, and test; ground support equipment; RTG shipping and launch support; design, reviews, and mission applications; project management, quality assurance and reliability, contract changes, non-capital CAGO acquisition, and CAGO maintenance; contractor acquired government owned property (CAGO) acquisition.

610 (INIS-mf–14340, pp. 229-239) **Thermal neutron capture gamma ray analysis with NaI(Tl) detector.** Dharmavanij, W.; Kajornrith, V.; Tantisatayaraks, W.; Chongkum, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

To investigate nuclear reaction from thermal neutron capture, the prompt gamma rays from (n,r) reaction with high energy range between 0.5-10 MeV were measured by a 5" x 5" NaI(Tl) detector. A 5 Ci ^{241}Am/Be was used as an isotopic neutron source. The objective is to study the experimental arrangements and the feasibility of the experiment for analyzing the light elements interest.

611 (INIS-mf–14340, pp. 240-249) **Application of prompt gamma ray neutron activation analysis.** Dharmavanij, W.; Kajornrith, V.; Tantisatayaraki, W.; Chongkum, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

A technique of prompt-gamma ray neutron activation analysis (PGNAA) has been undertaken by Physics Division, Office of Atomic Energy for Peace (OAEP) in order to extend the analytical methods available at the Research Reactor (TRR1/M1). To develop the technique, the first (n,γ) apparatus is under constructed at the 6" beam tube of the reactor. The implemented apparatus using the isotopic neutron source, a 5 Ci and 50 Ci ^{241}Am/Be has been developed. Basic experiments were carried out to determine the effective position within neutron beam. The purpose of this paper is to outline the application of PGNAA technique and the specialized experimental facilities.

612 (LA–12873-PR) **Monthly progress report heat source technology programs, June 1994.** George, T.G. (comp.). Los Alamos National Lab., NM (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002455. Source: OSTI; NTIS; GPO Dep.

This monthly report describes activities performed in support of Cassini fueled-clad production and studies related to the use of $^{238}PuO_2$ in radioisotope power systems carried out for the Office of Special Applications of the U.S. Department of Energy (DOE) by

Los Alamos National Laboratory (LANL). Most of the activities described are ongoing; the results and conclusions described may change as the work progresses.

0705 Health and Safety

613 (WSRC-MS–94-0180) **Unknown plant deconstruction hazard – Toxic COS and CS_2 gas from torch cutting of pipe.** Martin, H.L.; Nutt, A.W.; Myers, B.L.; Hightower, J.O. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-941128–2: Annual meeting of the American Institute of Chemical Engineers, San Francisco, CA (United States), 13-18 Nov 1994). Order Number DE95001896. Source: OSTI; NTIS; INIS; GPO Dep.

An employee exhibited signs of illness after apparently inhaling fumes generated from a pipe that had been cut with a cutting torch. Identification and quantification of the hazardous air emission for reduction of risk via the Department of Energy Class B Investigation are described in this case study. The old hydrogen sulfide gas flare pipe in the heavy water plant of the Savannah River Site has been abandoned with one end open to atmosphere for almost twenty years. The pipe was being removed and cut into sections for disposal during an asbestos abatement project. It contained ash like corrosion deposits that smolder after torch cutting. Investigation revealed that burning of carbon and sulfur in the oxygen deficient atmosphere in the ash generated carbonyl sulfide (COS) and carbon disulfide (CS_2) gas, which vented when the pipe was moved by the injured construction rigger. This is believed to be the first well documented exposure and response of a human to high concentration COS gas. Sulfur dioxide (SO_2) gas is also generated during the cutting. SO_2 is almost impossible to inhale and has apparently prevented a similar injury during the cutting. SO_2 is almost impossible to inhale and has apparently prevented a similar injury during the many years of US and Canadian heavy water plant de-construction experience. Immediate water quench of the smoldering ash after each cut has eliminated the hazard of residual COS and CS_2 gas. This previously unrecognized industrial hazard may be encountered by other chemical and petroleum industries during torch cutting of pipes that contain similar deposits of iron oxide, iron sulfate, sulfur and carbon.

08 HYDROGEN

614 (DOE/FTR–94008306) **Travel to Japan for discussion on renewable energy projects: Foreign trip report, February 9–March 4, 1994.** Takahashi, P. National Renewable Energy Lab., Golden, CO (United States). 14 Mar 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94008306. Source: OSTI; NTIS (US Sales Only); GPO Dep.

Detailed discussions were held with the following individuals (see attachment for business card info): Hisao Oka, Chairman, NEDO; Morio, Murase, Executive Director, NEDO; Masao Wakayama, Director General; Naoko Hosaka, NEDO; Toshimichi Ishimaru, Director-General; Naoya Kitamura, Director, NEDO; Hiroshi, Katsumata, Director, NEDO; Hiroshi Kashiwagi, Director General, (MITI); Chihiro Watanabe, Deputy Dir-General, (MITI); Hidefusa Miyama, Senior Director, (MITI); Shoichi Katayama, director (MITI). My technical presentation focused on the United States Hydrogen Technical Advisory Panel (HTAP). However, as William Hoagland was scheduled to speak on the US Hydrogen Program, I was asked to also elaborate on aspects of the subject more closely related to our activities in Hawaii.

0802 Storage, Transport, and Handling

615 **Dimensionally stable metallic hydride composition.** Heung, L.K. To Dept. of Energy. 1992. Filed date 29 Sep 1992. U.S. Patent Application 7-952,931. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001774. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A stable, metallic hydride composition and a process for making such a composition. The composition comprises a uniformly blended mixture of a metal hydride, kieselguhr, and a ballast metal, all in the form of particles. The composition is made by subjecting a metal hydride to one or more hydrogen absorption/desorption cycles to disintegate the hydride particles to less than approximately 100 microns in size. The particles are partly oxidized, then blended with the ballast metal and the kieselguhr to form a uniform mixture. The mixture is comressed into pellets and calcined. Preferably, the mixture includes approximately 10 vol. % or more kieselguhr and approximately 50 vol. % or more ballast. Metal hydrides that can be used in the composition include Zr, Ti, V, Nb, Pd, as well as binary, tertiary, and more complex alloys of La, Al, Cu, Ti, Co, Ni, Fe, Zr, Mo,, Ca, Mn, and mixtures and other combinations thereof. Ballast metals include Al, Cu and Ni.

09 BIOMASS FUELS

Refer also to citation(s) 927

616 (ETDE/DE-mf–95715690) **Bundesforschungsanstalt fuer Landwirtschaft Braunschweig-Voelkenrode (FAL). Annual report 1993.** Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig (Germany). 1994. 241p. (In German). Order Number DE95715690. Source: OSTI; NTIS (US Sales Only).

The FAL does research in the agricultural and related sciences. It publishes its research findings and cooperates internationally with scientists and institutions. Among its tasks are the development of scientific fundamentals as decision aids for nutritional science, agriculture, forestry, and consumer policy, as well as the wider application of the research findings in order to promote public welfare. (orig./EF)

0907 Resources

617 (ETDE/DE-mf–95716323) **Method for the transfer of genes in winter rape to plant breeders praxis: Final report.** Dettendorfer, J. PLANTA Angewandte Pflanzengenetik und Biotechnologie GmbH, Einbeck (Germany). [1993]. 24p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0319412E. Order Number DE95716323. Source: OSTI; NTIS (US Sales Only).

Parallel to the work on the isolation of genes of the fatty acid biosynthesis, a method of gene transfer into winter rapeseed by means of Agrobacterium tumefaciens was developed. Root growth of the transgenic plants was successful, and they were transferred into a greenhouse for seed production. A bonitation of the physiological development was carried out. (orig./EF)

0908 Production

618 (ETDE/DE-mf–95708780) **Renewable raw materials: Balance of research promotion.** Bundesministerium fuer Forschung und Technologie. Pressedokumentation, v. 36/92. Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Referat fuer Presse und Oeffentlichkeitsarbeit. 23 Nov 1992. 69p. (In German). Order Number DE95708780. Source: OSTI; NTIS (US Sales Only).

The BMFT promotion program 'renewable raw materials' included for the first time an extensive attempt for biotechnical and technical as well as energetic use. The promotional activities were devided into the industrial raw material sector and the energy sector (fuels, heat/power) in which large amounts of renewable materials could be used; but the creation of value and the research potential are low in this area. As large amounts could be used this area could in the short term contribute to solve the problem of exessive production in agriculture, but the economic aspect - seen from the point of view of overall as well as national economy - has to be considered in a subtly differentiated way. (orig./EF)

619 (ETDE/DE-mf–95716349) **Results of the Baden-Wuerttemberg cultivation experiments with sunflowers, soybeans and flax plants, 1992.** Informationen fuer die Pflanzenproduktion, v. 9/1992. Ott, J.; Amann, C. Landesanstalt fuer

Pflanzenbau Forchheim, Rheinstetten (Germany); Ministerium fuer Ernaehrung, Landwirtschaft, Umwelt und Forsten des Landes Baden-Wuerttemberg, Stuttgart (Germany). 16 Mar 1993. 39p. (In German). Order Number DE95716349. Source: OSTI; NTIS (US Sales Only).

The report discusses cultivation methods, effects of weather on crop yields, yields of the different varieties, recommendations of different varieties of the above-mentioned oilseed plants. (EF)

0909 Processing

Refer also to citation(s) 617, 618, 1893

620 (DOE/CE/15594–T2) **A low energy continuous reactor separator for the production of ethanol from corn grits/starch and biomass streams: 2nd Quarterly report, August 1–October 15, 1994.** Bio-Process Innovation, Inc., West Lafayette, IN (United States). [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15594. Order Number DE95002256. Source: OSTI; NTIS; GPO Dep.

This project is an attempt to develop and demonstrate an improved reactor for the production of ethanol from starch and ligno-cellulosic streams. Bio-Process Innovations holds a patent on this reactor technology, and is directing the project. A Continuous Stirred Reactor Separator (CSRS) is being built on a pilot plant scale for testing at a small Iowa ethanol plant (Permeate Refining) while bench scale tests on the reactor system are being performed at Purdue University. The CSRS unit combines several operations within the confines of the reactor vessel: (1) complex carbohydrates are reduced to simple sugars by enzymatic breakdown; (2) sugars are converted to ethanol by yeast or bacteria; and (3) the ethanol is separated by a stripping gas stream. The ethanol is removed from the stripping gas in an absorber, and then taken to an extractive distillation column. This unit should allow concentrated feeds to be converted to ethanol, and the use of bottoms recycle will be extensively tested to establish the limits of minimizing net bottoms water production leaving the plant. During the first quarter, a flocculant yeast was selected, a xylose fermenting yeast strain selected, and some experiments on no-cook starch conversion to ethanol completed. During the last (second) quarter, the authors have tested the effect of bottoms water recirculation on the reactor performance, the performance of the lab scale unit on molasses, and done some work on biomass conversion to ethanol.

621 (ETDE/DE-mf–95716354) **The use of flow zytometry for microbiological analysis and assessing the performance of aerobic and anaerobic sewage works with the aim of biological process optimisation and control: Final report.** Nader, W. ORPEGEN Medizinisch-Molekularbiologische Forschungsgesellschaft mbH, Heidelberg (Germany). 30 Sep 1991. 47p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 02WA8940. Order Number DE95716354. Source: OSTI; NTIS (US Sales Only).

The aim of the work was to make biological parameters measurable if possible, by using flow zytometry, for sewage works processes such as nitrification, the formation of expanding sludge, biological dephosphating and anaerobic sludge stabilisation, so that sludges can be characterized regarding their performance. These measurement parameters should be tested as control parameters for the optimisation of the sewage works processes in the sense of a higher process stability in practice. Intermediate aims for this were the development of control reagents and a simplified flow zytometer, for use in practice, by which these measurements should be made possible in everyday use in sewage works. The activity and the concentration of those bacteria were defined as suitable biological measurement parameters, which have decisive effects on the sewage works processes listed above. These parameters can be made measurable by determining the conversion performance of sludges and by counting the bacteria concerned by means of flow zytometry after marking them by specific antibodies. (orig.)

622 (ETDE/DE-mf–95716373) **Investigation on continuous ethanol production using Zymomonas mobilis: Final report.** Franz, K.; Bettmann, H.; Dorfer, J.; Ferretti, S.; Schmitz, B. Stuttgart Univ. (Germany). Inst. fuer Chemische Verfahrenstechnik. Mar 1990. 250p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT BCT0394. Order Number DE95716373. Source: OSTI; NTIS (US Sales Only).

Bioalcohol production is economically efficient only if the substrate cost is low. This is the case with residues and waste materials where alcohol is produced in combined processes. The adhesivity and biofilm formation rate of Zymomonus mobilis were investigated in batch cultures and continuous cultures. It was particularly important to find suitable substrates. A number of substrate materials was characterized with regard to their material and fluidisation characteristics, and tested in reactors with a stationary fluidized had. The performance of circulation fluidized beds was investigated in model systems with a view to the envisaged use of industrial-scale loop reactors. The process calculations were supplemented by calculations in which the activity of free and immobilized cells was considered separately, and random solid fractions or fluidized bed volume fractions could be taken into account. The influence of bacterial impurities was investigated as well. (orig./EF)

623 (INIS-mf–15067) **Use of specific microorganisms for in-situ sanitation of long-standing pollution sites: Final report.** Dengler, D. Institut fuer Umweltanalytik und Biotechnologie GmbH, Pforzheim (Germany). Jul 1988. 101p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 1450401. Order Number DE95716366. Source: OSTI; NTIS (US Sales Only); INIS.

Laboratory and semi-industrial experiments were carried out in order to find out whether soils contaminated with mineral oil can be regenerated by stimulating microbial growth or by introducing additional oil-degrading microorganisms into the soil. In addition, methods were tested in which contaminants are wasted out with the aid of tensides. (orig.)

624 (NEI-DK–1649) **Full scale enzymatic hydrolysis.** Bioscan A/S, Odense (Denmark). Aug 1994. 8p. (In Danish). Contract ENS-51161-94.0013. Order Number DE95707290. Source: OSTI; NTIS.

An investigation of the feasibility of adding enzymes during the process of anaerobic biomass conversion in order to increase the production of methane is described. The experiment was carried out at a biomass conversion plant at Lintrup (Denmark) in order to compare field results with a laboratory experiment of the same nature. During the continuous fermentation, direct doses of a relatively large amount of enzymes (ca. 6 ml enzyme concentrate mixture per kg dry matter) were added. The idea was that in this way an increase in the amount of hydrolyzed material during a short period could be achieved and thus the conversion of matter that is otherwise difficult to decompose (in this case slurried manures and organic wastes from the food and medicinal industries) could be optimized. This would result in an increased growth of the microorganisms, especially the hydrolytic fermentative. The increase in the growth of the bacteria results in an increase in the amount of extracellular enzymes produced by the hydrolytic fermentative bacteria, and this should promote the hydrolysis of the polymeric material. It was found that the use of enzymes as additives did not increase the production of methane in the anaerobic biomass conversion plant. (AB)

625 (NEI-DK–1671) **Control and regulation of biomass conversion plants: Adaptive regulation of biogas reactors according to total concentration of volatile fatty acids. Control models and implementation.** Jungersen, G. Dansk Teknologisk Inst., Taastrup (Denmark). Bioteknik. Dec 1993. 16p. (In Danish). Contract ENS-1383/91-0001. Order Number DE95707364. Source: OSTI; NTIS.

EFP-91.

The aim was to develop a model to be used within a regulation/control system to keep volatile fatty acids in a biogas reactor within a given interval by regulating the biomass input rate - and also to investigate potentials for implementing the regulating system as an integral part of a standardized control and regulation system which at the same time could be used for other forms of regulation related to the plant. On-line measurement of specific, instead of total,

concentrations of volatile fatty acids, especially of acetates, isobutyrates and iso-valerates, will produce a better picture of the immediate conditions of the biomass processing. The adaptive regulation system proved to be satisfactory in use and was considered to be the most suitable for the regulation of biogas reactors with online determination of volatile fatty acid concentrations. It is suggested that the optimal strategy for implementation of the system is to use a commercial standard control and regulation monitoring programme (SRO) programmed in 'C'. Fix Dmacs system is recommended as it contains facilities for implementation of the system and can also be further developed. (AB) (10 refs.)

626 (TVA/NFERC–93/8) **Case studies of sewage treatment with recovery of energy from methane.** Phillips, C.A.; Webster, N.; Wander, J. Wander Associates (United States). 30 Jun 1993. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-93CE16078. (Z–347). Order Number DE95001719. Source: OSTI; NTIS; GPO Dep.

In the Southeast, there are about 3,000 wastewater plants with a capacity of over one million gallons per day. Under this study, operating data and available financial information on a variety of technologies for large and small plans was documented for ten facilities. Studies were done on wastewater treatment plants (WWTPs) with design capacities ranging from 9.5–120 million gallons per day. All of these WWTPs recover the gas produced in their anaerobic digesters and use at least part of it as fuel for boilers and/or internal combustion engines. The engines power generators, blowers, or pumps, and most are equipped with heat recovery systems. Based on the historical data provided by the participants in this study and from the authors' own technical analysis, methane recovery and utilization systems appear to be cost effective, although the degree of cost effectiveness varies widely. The types of energy recovery systems are not uniform among all the participants so that the cases in this limited survey are not precisely comparable to each other. Also, reliance on historical data and cost information generated from portions of total plant operations and estimates makes it difficult to complete analysis of specific variables. The fact remains, however, that regardless of the individual type(s) of digester gas energy recovery system in use, data from seven of the ten participants reflected annual savings ranging from $67,200 to more than $700,000. Further, Wander Associates current analysis reflects that nine of the ten realized annual savings ranging from $5,000 to more than $600,000.

627 (Z–334) **A process for separating acid-sugar mixtures using ion exclusion chromatography.** Hester, R.D. (University of Southern Mississippi, Hattiesburg, MS (United States)); Hartfield, S.W.; Farina, G.E. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 8p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE95001717. Source: OSTI; NTIS.

Work using a low-temperature concentrated sulfuric acid hydrolysis process to convert the cellulosic fraction of corn stover to monomeric sugars demonstrated the high conversion efficiencies possible with that process. The TVA work also confirmed the need for a cost-effective acid-sugar separation process. A preparative-scale ion-exclusion chromatography (IEC) system was designed, constructed, and tested with a variety of synthetic solutions and actual hydrolyzates. Although significant dispersion was observed initially, design changes were effective in minimizing this phenomenon. Data collected during the operation of the preparative-scale system were used in the design and construction of an IEC miniplant capable of processing larger volumes of synthetic solutions or hydrolyzates and in the design of an extraction-assisted IEC system. The data were also used to assess the viability of a continuous feed IEC system. This paper includes a discussion of the IEC process, provides overall material balances for various IEC process scenarios, and presents a discussion on process economics.

0920 Combustion

Refer also to citation(s) 626

628 (NEI-DK–1661) **Utilization of straw- and wood pellets for fuelling of small heating systems.** Andreasen, P. Dansk Teknologisk Inst., Taastrup (Denmark). Energiteknologi. Mar 1994. 70p. (In Danish). Contract ENS-51161-92.0078; Contract ENS-51161-93.046. Order Number DE95707337. Source: OSTI; NTIS.

Straw pellets have been used on a very limited scale as a fuel, and that is why there is very little practical experience collected about problems as: ash/slags conditions, emissions, other problems of boiler operation, and the work effort necessary to use straw pellets as a fuel. Five test series have been performed with five different boiler systems, and five different straw- and wood pellets. Various anti slag means were evaluated. For the first two boilers and pellets, found the most suitable of all, further long-period tests are planned. All the straw pellets were prepared from the yellow wheat straw. Pellets containing caolin as an anti-slag means gave a light ash without slags, while the oter pellets left some slags and major part of the ashes fused into a compact mass. Straw pellets requaire more work than the wood ones. (EG)

629 (NREL/CP–433-7265) **Program and abstracts.** National Renewable Energy Lab., Golden, CO (United States). [1994]. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-9409224–Absts.: Biomass pyrolysis oil properties and combustion meeting, Estes Park, CO (United States), 26-28 Sep 1994). Order Number DE94011891. Source: OSTI; NTIS; GPO Dep.

The increasing scale-up of fast pyrolysis in North America and Europe, as well as the exploration and expansion of markets for the energy use of biocrude oils that now needs to take place, suggested that it was timely to convene an international meeting on the properties and combustion behavior of these oils. A common understanding of the state-of-the-art and technical and other challenges which need to be met during the commercialization of biocrude fuel use, can be achieved. The technical issues and understanding of combustion of these oils are rapidly being advanced through R&D in the United States, Canada, Europe and Scandinavia. It is obvious that for the maximum economic impact of biocrude, it will be necessary to have a common set of specifications so that oils can be used interchangeably with engines and combustors which require minimal modification to use these renewable fuels. Fundamental and applied studies being pursued in several countries are brought together in this workshop so that we can arrive at common strategies. In this way, both the science and the commercialization are advanced to the benefit of all, without detracting from the competitive development of both the technology and its applications. This United States-Canada-Finland collaboration has led to the two and one half day specialists meeting at which the technical basis for advances in biocrude development is discussed. The goal is to arrive at a common agenda on issues that cross national boundaries in this area. Examples of agenda items are combustion phenomena, the behavior of trace components . of the oil (N, alkali metals), the formation of NO_x, in combustion, the need for common standards and environmental safety and health issues in the handling, storage and transportation of biocrudes.

0930 Economic, Industrial, and Business Aspects

Refer also to citation(s) 1055

0950 Environmental Aspects

630 (CONF-9410176–1) **Perennial grass production for biofuels: Soil conversion considerations.** McLaughlin, S.B. (Oak Ridge National Lab., TN (United States)); Bransby, D.I.; Parrish, D. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. national bioenergy conference; Reno, NV (United States); 2-6 Oct 1994. Order Number DE95001347. Source: OSTI; NTIS; GPO Dep.

The increased use of renewable fuels for energy offers the United States a mechanism for significantly reducing national dependency on imported oil, reducing greenhouse gas emissions, and improving regional agricultural economies. As mandated by

law, a wide range of issues have been raised regarding the net environmental impacts of implementation of these new technologies. While uncertainties regarding both positive and negative environmental influences still exist in many areas of this new technology, it is now possible to address with substantial certainty the positive aspects of perennial herbaceous energy crops on several important soil conservation issues. Past experience with forage grasses and recent research with switchgrass. A warm season perennial forage grass selected as one of the model bioenergy species, indicates that important benefits will be gained in the area of soil conservation as grasses replace energy-intensive annual row crops. These include reduced erosion, improved conservation of water and nutrients, and increased productivity of soils by the deep and vigorous rooting systems of perennial warm-season gasses.

10 SYNTHETIC FUELS

1002 Production

Refer also to citation(s) 26, 27, 28, 29, 31, 33, 36, 134, 1345

631 (DOE/PC/92112–T6) **Novel catalysts for methane activation: Quarterly report No. 3, April 1, 1993–June 30, 1993.** Hirschon, A.S.; Malhotra, R.; Wilson, R.B. SRI International, Menlo Park, CA (United States). 31 Aug 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92112. Order Number DE95002420. Source: OSTI; NTIS; GPO Dep.

The objectives of this project are to test novel fullerene based catalysts for application in methane activation. Fullerenes are a recently discovered allotrope of carbon that have been found to possess unusual properties, some of which may be ideal for methane conversion to higher hydrocarbons. The project is divided into three technical tasks. Task 1 deals with the synthesis and characterization of the fullerenes and fullerene soots, Task 2 with the testing of the catalysts, and Task 3 with the evaluation of the results and technical reporting requirements. This quarter we prepared fuuerene soot and metallized fullerene soot and rebuilt our experimental testing system to be more suitable for the evaluation of the catalysts. The results and accomplishments are presented.

632 (DOE/PC/92112–T7) **Novel catalysts for methane activation: Quarterly report No. 7, April 1, 1994–June 30, 1994.** Hirschon, A.S.; Wu, H.J.; Malhotra, R.; Wilson, R.B. SRI International, Menlo Park, CA (United States). Sep 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92112. Order Number DE95002639. Source: OSTI; NTIS; GPO Dep.

SRI Project 4069.

Fullerenes are a recently discovered allotrope of carbon that have been found to possess unusual properties, some of which may be ideal for methane activation. This project is designed to evaluate these carbon based materials for conversion of methane into higher hydrocarbons. The project is divided into three technical tasks. Task 1 deals with the synthesis and characterization of the fullerenes and fullerene soots, Task 2 with the testing of the catalysts, and Task 3 with the evaluation of the results and technical reporting requirements. The results and accomplishments for this quarter are summarized below; soots were prepared either by extraction in toluene or sublimation of the lower fullerenes (such as C_{60}/C_{70}); a fullerene soot was prepared by adding C_{60} to an extracted soot; fullerene soot was doped with platinum and nickel by incipient wetness techniques, and a nickel fullerene complex was synthesized using organometallic techniques; soot from three manufactures were tested for methane activation and found to exhibit small but notable differences in reactivity; increasing the surface area of soots by partial oxidation with $C0_2$ did not cause significant changes in the reactivities; the effect of the extraction and sublimation of C_{60}/C_{70} was determined to be minor; the effect of added C_{60} to an extracted MER soot was determined to be beneficial; acetylene black was tested and found to have higher activity and lower selectivity than a Norit-A carbon; and nickel and platinum doped soots were found to be more active than the undoped soots.

1004 Combustion

Refer also to citation(s) 30

13 HYDRO ENERGY

1301 Resources and Availability

633 (BNWL-CC–1378) **A mathematical model of the temperature and current distributions in a deep stratified reservoir.** Burnett, R.A. Pacific Northwest Lab., Richland, WA (United States). 27 Nov 1967. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94016941. Source: OSTI; NTIS; GPO Dep.

The necessity of being able to predict and control downstream river temperatures has created the need of an effective model of Lake Roosevelt. A model based on the physical equations governing the internal hydrodynamic and thermal behavior of the reservoir is proposed. A description is given of the physical significance of the model equations as they apply to the reservoir. Computer approaches to the model are discussed. A simplified steady-flow model was mechanized on the analog computer. The results of the simplified analog model were sufficient to demonstrate the ability of the mathematical model to compute the flow patterns in an isothermal reservoir. The ability of the model to accurately couple the thermal distribution of a stratified reservoir with its flow patterns remains to be demonstrated. An outline has been drawn up of a hybrid computer method of adding the remaining model complexities, and with further work it appears likely that a reasonable amount of success can be obtained.

634 (DOE/EIS–0194-MAP) **Tenaska Washington II Generation Project: Tenaska Washington Partners II, L.P.: Mitigation Action Plan.** USDOE Bonneville Power Administration, Portland, OR (United States). 26 Mar 1994. 30p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94017205. Source: OSTI; NTIS; GPO Dep.

BPA has decided to purchase electrical power to be generated by a privately-owned gas-fired combustion turbine (CT) plant in the Frederickson Industrial Area, Pierce County, Washington. The proposed Tenaska Washington R Generation Project (Tenaska Project) would produce 240 average megawatts (aMW) of electrical energy and would be developed and operated by Tenaska Washington Partners II, L.P. (Tenaska), a developer of generation resources. BPA expects the Tenaska Project to be in commercial operation by July 1996. BPA has statutory responsibilities to supply electrical power to its utility, industrial and other customers in the Pacific Northwest. The Tenaska Project is needed to meet electrical power supply obligations of these customers. The Tenaska Project would also meet a number of other system requirements. Included among these is firming otherwise non-firm hydroelectric power so that it can be sold as higher value firm power. The Tenaska Project offers an energy resource which can provide BPA the flexibility to operate an increasingly constrained hydro system.

635 (NEI-DK–1662) **Potentials for hydroelectricity close to urban areas in Greenland.** Groenlands Energiforsyning, Copenhagen (Denmark). Vandkraftafd. May 1994. 48p. (In Danish). Order Number DE95707335. Source: OSTI; NTIS.

A general survey of the potentials for hydroelectricity close to urban areas in Greenland based on data and information gathered during the course of investigations carried out during the last 20 years. These potentials are examined in relation to existing diesel plants, their economies and environmental impacts. Details are given on information sources. (AB)

1305 Economic, Industrial and Business Aspects

636 (INIS-mf–14366) **Integrated operation of hydro thermal system.** Nanthakumar, J. Ceylon Electricity Board, Colombo (Sri Lanka). 1994. 16p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604166. Source: OSTI; NTIS (US Sales Only); INIS.

Long-term power system expansion planning studies are carried out to meet the electricity requirement in the future. Prior to the expansion planning studies, it is essential to know the energy potential of the existing generating system, especially the hydro power plants. Detailed hydro thermal stimulation studies of the integrated system is therefore carried out to determine the best way to maximise the hydro energy of the existing and committed plants. The results of the integrated system simulated model are stored in numerous files and are available for retrieval. Most important output used for expansion analysis is the energy production of each hydro plant. The annual hydro energy potential of the total hydro system of Sri Lanka for the hydrological year from 1949 to 1988 is given. Hydro condition data with different probability levels are also indicated.

1306 Environmental Aspects

637 (BNWL-SA–3585) **Exploratory studies of the interactions of gas supersaturation and temperature on mortality of juvenile salmonids.** Coutant, C.C. Pacific Northwest Lab., Richland, WA (United States). 28 Sep 1970. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001331. Source: OSTI; NTIS; GPO Dep.

This document contains information regarding the effects of thermal effluents on the Columbia River during September 1970. Thermal effluents increase the gas saturation in water leading to the mortality of fishes. The "gas bubble" disease has been considered to be mostly a physical phenomenon due to the differences between the sum of the individual tensions of the gasses dissolved in water and the hydrostatic pressure. A drop in hydrostatic pressure was shown to induce bubble formation in the fish tissues. It has been recognized that chronic high gas saturations such as exist seasonally in the Columbia River also create gas embolisms and inflict heavy mortalities on anadramous fishes.

638 (DOE/EA–0941) **Lower Yakima Valley Wetlands and Riparian Restoration Project: Final environmental assessment.** Bonneville Power Administration, Portland, OR (United States); Yakima Indian Nation, Toppenish, WA (United States); Bureau of Indian Affairs, Washington, DC (United States). [1994]. 67p. Sponsored by USDOE, Washington, DC (United States). (DOE/BP–2455). Order Number DE95001768. Source: OSTI; NTIS; INIS; GPO Dep.

Bonneville Power Administration (BPA) proposes to fund that portion of the Washington Wildlife Mitigation Agreement pertaining to the Lower Yakima Valley Wetlands and Riparian Restoration Project (Project) in a cooperative effort with the Yakama Indian Nation and the Bureau of Indian Affairs (BIA). The proposed action would allow the sponsors to secure property and conduct wildlife management activities for the Project within the boundaries of the Yakama Indian Reservation. This Environmental Assessment examines the potential environmental effects of acquiring and managing property for wildlife and wildlife habitat within a large 20, 340 hectare (50, 308 acre) project area. As individual properties are secured for the Project, three site-specific activities (habitat enhancement, operation and maintenance, and monitoring and evaluation) may be subject to further site-specific environmental review. All required Federal/Tribal coordination, permits and/or approvals would be obtained prior to ground disturbing activities.

639 (PNL-SA–7574) **Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers.** Montgomery, J.C. (Pacific Northwest Lab., Richland, WA (United States). Ecosystems Dept.). Pacific Northwest Lab., Richland, WA (United States). Feb 1979. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001330. Source: OSTI; NTIS; GPO Dep.

In 1976 and 1976, 179 smallmouth bass (Micropterus dolomieui) and 85 northern squawfish (Ptychocheilus oregonensis) were collected by angling from the lower Snake and mid-Columbia Rivers, southeastern Washington. All fish were examined externally for gas bubble syndrome. Emboli were found beneath membranes of the operculae, body and fins of 128 bass (72%) and 71 squawfish (84%). Hemorrhage was also noted on the caudal, anal and pectoral fins of several bass. Presence of gas bubble syndrome corresponded to the spring runoff when total dissolved gas supersaturations in river water exceeded 115%. Effectiveness of measures to reduce supersaturation levels for protection of salmonid outmigrants could be reflected in resident river fish. Hydroelectric dams on the Columbia and Snake rivers have created a source of environmental stress, causing bubble "disease" among fish populations (Collins et al. 1975, Ebel 1977). Water passing over spillways during the spring runoff entrains air, imparting excessively high levels of dissolved gases to the river below. Distances between successive dams, which are linked together by reservoirs, are usually too short for river water to equilibrate to normal saturation levels. Therefore, high saturations of gases are maintained as the water reaches each successive downstream structure.

14 SOLAR ENERGY

Refer also to citation(s) 2452

1401 Resources and Availability

640 (IC–94/101) **Estimation and analysis of spectral solar radiation over Cairo.** Abdel Wahab, M.M. (International Centre for Theoretical Physics, Trieste (Italy)); Omran, M. International Centre for Theoretical Physics, Trieste (Italy). May 1994. 14p. Order Number DE95606029. Source: OSTI; NTIS (US Sales Only); INIS.

This work presents a methodology to estimate spectral diffuse and global radiation on horizontal surface. This method is validated by comparing with measured direct and global spectral radiation in four bands. The results show a good performance in cloudless conditions. The analysis of the ratio of surface values to extraterrestrial ones revealed an over-all depletion in the summer months. Also there was no evidence for any tendency for conversion of radiational components through different bands. The model presents excellent agreement with the measured values for (UV/G) ratio. (author). 7 refs, 4 figs, 3 tabs.

641 (IC–94/140) **Predicting the components of the total hemispherical solar radiation from sunshine duration measurements in Lagos, Nigeria.** Maduekwe, A.A.L. (Usmanu Danfodiyo Univ., Sokoto (Nigeria). Dept. of Physics); Chendo, M.A.C. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 16p. Order Number DE95606030. Source: OSTI; NTIS (US Sales Only); INIS.

Correlations for the city of Lagos (latitude 6.58 deg. N, longitude 3.33 deg. E) have been found between the records of bright sunshine hours and the daily and monthly components of the total hemispherical solar radiation. Four new models have been developed which include H/H_0 as a predictor in the Angstrom type models for the diffuse and beam fractions. They contain the quadratic term of the sunshine index, (n/N) and are given as follows: $Q/H_0=a+b(H/H_0)+c(n/N)+d(n/N)^2$ $Q/H_0=a+b(H/H_0)+d(n/N)^2$; $Q/H_0=a+b(H/H_0)+c(n/N)+d(n/N)^2$; $Q/H_0=a+b(H/H_0)+d(n/N)^2$; where Q is the diffuse or beam radiation on a horizontal plane. The statistical test carried out showed that the new equations generally improved the prediction of the beam or diffuse components from the Angstrom type equations by over 25%. (author). 21 refs, 3 tabs.

642 (NREL/SP–463-6156) **Solar Radiation Resource Assessment Project: Program overview of fiscal year 1993.** National Renewable Energy Lab., Golden, CO (United States). Jun 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94000286. Source: OSTI; NTIS; GPO Dep.

The mission of the Solar Radiation Resource Assessment Project is to provide essential information about the solar radiation resource to users and planners of solar technologies so that they can make informed and timely decisions concerning applications of those technologies. The project team accomplishes this by producing and disseminating relevant and reliable information about solar radiation. Topics include: Variability of solar radiation, measurements of solar radiation, spectral distribution of solar radiation, and

assessment of the solar resource. FY 1993 accomplishments are detailed.

1403 Economic, Industrial, and Business Aspects

643 (INIS-mf–14345, pp. 1) **Optimal design of large solar fields: Maximum energy output.** Appelbaum, J. (Tel Aviv Univ. (Israel). Dept. of Engineering Sciences); Crutchik, M. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR COLLECTORS/technology impacts

644 (INIS-mf–14345, pp. 2) **Second law aspects of solar thermal energy conversion.** Bejan, A. (Durham Univ. (United Kingdom)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL CONVERSION/ thermoelectric conversion; HEATING; SOLAR HEATING SYSTEMS; THERMOELECTRIC REFRIGERATORS

645 (INIS-mf–14345, pp. 3) **Thermal storage for solar dynamic power generation: Performance indicators in a second law perspective.** Bellecci, C. (Depatmento di Fisica, Universita' della Calabria, Calabria (Italy)); Conti, M. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/thermochemical heat storage

646 (INIS-mf–14345, pp. 4-5) **The relative degradation of various kinds of photovoltaic module after 6-7 years exposure to desert conditions.** Berman, D. (Jacob Blaustein Institute for Desert Research, Ben-Gurion University, Beer-Sheva (Israel)); Faiman, D. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTOVOLTAIC CELLS/weathering; DESERTS; WEATHERING

647 (INIS-mf–14345, pp. 5-7) **Outdoor I-V curves versus simulator measurements for characterizing photovoltaic modules.** Berman, D. (Jacob Blaustein Institute for Desert Research, Ben-Gurion University, Beer-Sheva (Israel)); Faiman, D.; Wohlgemuth. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTOVOLTAIC CELLS/simulators; SIMULATORS

648 (INIS-mf–14345, pp. 8-9) **Characterization of mirror reflectivity losses caused by dust deposited under various meteorological conditions.** Biryukov, S. (Jacob Blaustein Institute for Desert Research, Ben Gurion University of the Negev, Beer-Sheva (Israel)); Faiman, D.; Goldfeld, A. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR REFLECTORS/reflectivity; DUSTS; REFLECTIVITY

649 (INIS-mf–14345, pp. 11-12) ***On the second law efficiency of thermal energy storage.** Charach, Ch. (Jacob Blaustein Institute for Desert Research, Ben Gurion University of the Negev, Beer-Sheva (Israel)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR EQUIPMENT/thermal energy storage equipment; ENERGY EFFICIENCY; HEAT EXCHANGERS

650 (INIS-mf–14345, pp. 13-14) **The solar two project: A status and discussion of performance assessment.** Chavez, J.M. (Sandia National Labs., Albuquerque, NM (United States)); Kolb, G.J. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL POWER PLANTS/ commercialization; HEAT EXCHANGERS; SODIUM NITRATES; COMMERCIALIZATION; WORKING FLUIDS

651 (INIS-mf–14345, pp. 15) **Comparison of SEGS solar field performance from laboratory and operating plant testing.** Cohen, G. (KJC Operating Co., Boron, CA (United States)); Kearny, D.; Kolb, G. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL POWER PLANTS/ performance testing

652 (INIS-mf–14345, pp. 16) **Industrial opportunities for solar tower technologies in Israel.** Epstein, MM. (The Solar Research Facilities Unit The Weizmann Institute of Science, Rehovot (Israel)); Hodara, I. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL POWER PLANTS/ commercialization; ISRAEL; COMMERCIALIZATION

653 (INIS-mf–14345, pp. 28) **Potential uses of solar energy for water desalination.** Gluecktern, P. (Mekorot Water Co. Ltd., Tel Aviv (Israel)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. DESALINATION/dual-purpose power plants; DESALINATION; ECONOMIC ANALYSIS

654 (INIS-mf–14345, pp. 31-33) **Life cycle analysis of photovoltaic-supplied solar filling stations for electric passenger vehicles.** Huber, W. (Kernforschungsanlage Juelich GmbH

(Germany). Project Management for Energy Research (PLE)); Kolb, G. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTOVOLTAIC POWER PLANTS/ service life; ELECTRIC-POWERED VEHICLES; SOLAR BATTERY CHARGERS

655 (INIS-mf–14345, pp. 34-35) **Paraboloidal-dish solar power system: Comparative and economicaspects.** Kaneff, S. (Australian National Univ., Canberra, ACT (Australia)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PARABOLIC DISH COLLECTORS/ economic analysis; COMPARATIVE EVALUATIONS

656 (INIS-mf–14345, pp. 36-37) **Benefits of deploying solar systems at large scale and to provide energy in various forms.** Kaneff, S. (Australian National Univ., Canberra, ACT (Australia)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR INDUSTRY/economic analysis; PARABOLIC DISH COLLECTORS

657 (INIS-mf–14345, pp. 38) **Residential photovoltaic hybrid power system.** Kapner, M. (Power Authority of the State of New York, NY (United States)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTOVOLTAIC POWER SUPPLIES/ residential buildings; HYBRID SYSTEMS

658 (INIS-mf–14345, pp. 39-40) **Performance indicators for solar pipes with phase change storage.** Keizman, Y. (Tel Aviv Univ. (Israel). Dept. of Engineering Sciences); Sokolov, M. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. THERMAL ENERGY STORAGE EQUIPMENT/performance; PERFORMANCE

659 (INIS-mf–14345, pp. 41) **Efficiency measures in solar electrical production: A consistent terminology.** Kenan, G. (Solel Solar Systems Ltd., (Israel)); Cohen, G.; Gilon, Y. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR INDUSTRY/energy efficiency standards; STANDARDIZED TERMINOLOGY

660 (INIS-mf–14345, pp. 42) **A comparative configuration assessment of a solar thermal plant in the Eilat area.** Kenan, G. (Solel Solar Systems (Israel)); Merbl, A.; Gilon, Y. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL POWER PLANTS/ configuration; CONFIGURATION

661 (INIS-mf–14345, pp. 43-44) **Comparative assessment of the costs and benefits of solar thermal concentrating technologies for power generation.** Kleib, H. (Stuttgart Univ. (Germany). Inst. fuer Technische Thermodynamik und Thermische Verfahrenstechnik); Meinecke, W.; Staib, F. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL POWER PLANTS/ economic analysis

662 (INIS-mf–14345, pp. 45) **Correct measurements of the efficiency of solar cells as a basis for their comparative techno-economical analysis.** Koltun, M. (Institute of New Technologies, Moscow (Russian Federation)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR CELLS/economic analysis

663 (INIS-mf–14345, pp. 46) **Evaluation of the total cost of different photovoltaic cells and combined photovoltaic-thermal solar designs for the first Russian photovoltaic 1 MW power plant.** Koltun, M.M. (Institute of New Technologies, Moscow (Russian Federation)); Gukhman, G.A.; Cherniavski, A.A. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. PHOTOVOLTAIC POWER PLANTS/ economic analysis; PHOTOVOLTAIC CELLS; POWER RANGE 01-10 MW; RUSSIAN FEDERATION

664 (INIS-mf–14345, pp. 47) **On the optimization of the solar-driven combined cycle.** Kribus, A. (Solar Research Facilities Unit, Weizman Institute of Science, Rehovot (Israel)); Dagan, E.; Zaibel, E.; Karni, J. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/combined-cycle power plants; OPTIMIZATION

665 (INIS-mf–14345, pp. 48-49) **Comparative studies of direct and indirect absorption of concentrated solar flux for chemical storage of solar energy.** Levy, M. (Weizmann Inst. of Science, Rehovoth (Israel)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR ENERGY/thermochemical heat storage

666 (INIS-mf–14345, pp. 50-51) **Photo catalysis and radiation absorption in a solar plant.** Malato, S. (Platforma Solar de

Almeria, PSA, Tabernas (Spain)); Blanco, J. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/photochemical reactions; CHEMICAL REACTION KINETICS

667 (INIS-mf–14345, pp. 52) **Comparative evaluation of solar power generation options: A user's perspective.** Mancini, T.R. (Sandia National Labs., Albuquerque, NM (United States)); Gallup, D.R. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR ENERGY/power generation; COMPARATIVE EVALUATIONS

668 (INIS-mf–14345, pp. 55-56) **Comparative assessment of the technical performance of solar thermal concentrating technologies for power generation.** Meinecke, W. (Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt e.V., Koeln (Germany)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR THERMAL POWER PLANTS/ technology assessment

669 (INIS-mf–14345, pp. 60) **Assessment of performance and economics of parabolic trough solar electric systems for selected Mediterranean countries.** Nava, P. (Kearney and Associates, Del Mar, CA (United States)); Kearney, D.; Aringhoff, R. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/economics; PARABOLIC TROUGH COLLECTORS; ECONOMICS

670 (INIS-mf–14345, pp. 64-65) **Evaluation of performance and cost trade-off in the optimization of solar dish electric system.** O'Gallagher, J.J. (Chicago Univ., IL (United States). Dept. of Physics). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/economic analysis; PARABOLIC DISH COLLECTORS

671 (INIS-mf–14345, pp. 66-67) **Comparative assessments of solar and conventional power plants.** Pharabod, F. (Centre National de la Recherche Scientifique (CNRS), 92 - Meudon-Bellevue (France)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/comparative evaluations

672 (INIS-mf–14345, pp. 70-71) **Techno-electronic comparison of advanced solar power plant schemes.** Popel, S.O. (AN SSSR, Moscow (Russian Federation). Inst. Vysokikh Temperatur); Shpilrain, E.E. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR POWER PLANTS/economic analysis

673 (INIS-mf–14345, pp. 72-74) **Photovoltaics: Present status and comparative analyses.** Prince, M.B. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Photovoltaic energy systems have the long range potential for supplying a significant part of the world's need for electricity Even today, such systems offer many benefits compared to other energy systems such as fossil fuel, nuclear and other renewable systems. These include: stability, reliability, require no water, no moving parts, environmentally benign, moderate efficiency, modular, universally usable, easy maintenance, and low power distribution costs. This paper will present information on present costs of the key system components, realistic cost projections and the results of a comparative study of three renewable approaches for a large system. (author), (tabs. 2).

674 (INIS-mf–14345, pp. 75-76) **The technoeconomic evaluation of solar steam supply to fossil fired combined power cycle.** Rheinlander, J. (Center for Solar Energy and Hydrogen Research, Baden-Wuerttemberg (Germany)); Ratzesberger, R.; Frithjof, S. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. COMBINED-CYCLE POWER PLANTS/ economic analysis; SOLAR ENERGY; STEAM GENERATORS

675 (INIS-mf–14345, pp. 77) **Thermodynamics of solar power conversion.** Ries, H. (Weizmann Inst. of Science, Rehovoth (Israel)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR ENERGY CONVERSION/ thermodynamics; THERMODYNAMICS

676 (INIS-mf–14345, pp. 79) **Methods of evaluating benefits of solar fuel and power production.** Spiewak, I. (Weizmann Inst. of Science, Rehovoth (Israel)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR ENERGY/economic analysis

677 (INIS-mf–14345, pp. 80-81) **Uniform guidelines for reporting dish/Stirling solar electric system performance to permit comparison.** Stine, W. (Mechanical Engineering Department, California State Polytechnic University, Ponoma CA (United States)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International

conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STIRLING ENGINES/performance; REPORTING REQUIREMENTS; PERFORMANCE

678 (INIS-mf–14345, pp. 82) **Solar dish/Stirling technology, a world status report and comparison.** Stine, W. (Mechanical Engineering Department, California State Polytechnic University, Ponoma CA (United States)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. STIRLING ENGINES/technology assessment

679 (INIS-mf–14345, pp. 83-84) **Solar thermal activities in Australia: An overview.** Theden, U.; Stein, W. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. SOLAR ENERGY/australia; AUSTRALIA

680 (INIS-mf–14345, pp. 85-87) **Grid-connected solar power generation a utility's view.** Weiner, D. (Israel Electricity Company, Tel Aviv (Israel)); Meron, G.; Fisher, D. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this paper is to analyze these new means of production from the electric utility point of view. This analysis will take into account the experience gained by Israel Electric Corporation while operating three demonstration plants. In addition, a techno-economic evaluation photovoltaic and thermal systems is presented and compared to that of conventional generation.

681 (INIS-mf–14345, pp. 88-89) **Large scale maximum concentration central receiver systems.** Yogev, A. (Weizmann Inst. of Science, Rehovoth (Israel)). Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. CENTRAL RECEIVERS/energy efficiency

1405 Solar Energy Conversion

Refer also to citation(s) 1114, 1115, 1374

682 (DOE/ER/14185–T1) **Ultrafast optical studies of surface reaction processes at semiconductor interfaces: Progress report.** Miller, R.J.D. Rochester Univ., NY (United States). Dept. of Chemistry. [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER14185. Order Number DE95001548. Source: OSTI; NTIS; GPO Dep.

The DOE funded research has focused on the development of novel non-linear optical methods for the in situ study of surface reaction dynamics. In particular, the work has concentrated on interfacial charge transfer processes as this is the simplest of all surface reactions, i.e., no bonds are broken and the reaction is derived from nuclear repolarization. Interfacial charge transfer forms the basis for a number of important solar energy conversion strategies. In these studies, semiconductor liquid junctions provide a convenient system in which the interfacial charge transfer can be optically initiated. The all-optical approach necessitates that the dynamics of the charge transfer event itself be put in the proper context of the operating photophysical processes at the surface. There are at least four dynamical processes that are coupled in determining the overall rate of electron flux across the interface. In the limit that interfacial charge transfer approaches strong coupling, the time scale for transport of even field accelerated carriers within the space charge region becomes comparable to the charge transfer dynamics. The transport component needs to be convolved to probes of the carrier population at the surface. The other two dynamical processes, carrier thermalization and surface state trapping, determine the states which ultimately serve as the donor levels to the solution acceptor distribution. In terms of the hot carrier model, these latter two processes compete with direct unthermalized charge transfer. There is a fifth dynamical process which also needs consideration: the solvent modes that are coupled to the reaction coordinate. Ultimately, the dynamics of solvent relaxation determine the upper limit to the charge transfer process. Different optical techniques have been developed to follow all the above dynamical processes in which a real time view of charge transfer dynamics at semiconductor surfaces is emerging. These results are discussed here.

683 (ETDE/DE-mf–95711772) **GaAs thin film solar cells: Final report.** Bett, A.; Bronner, W.; Cardona, S.; Ehrhardt, A.; Habermann, G.; Habich, A.; Lanyi, P.; Lutz, F.; Nguyen, T.; Schetter, C.; Sulima, O.; Welter, H.; Yavas, O. Fraunhofer-Institut fuer Solare Energiesysteme (ISE), Freiburg im Breisgau (Germany). Nov 1992. 166p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328554B. Order Number DE95711772. Source: OSTI; NTIS (US Sales Only).

This R and D project focused on the development of materials and technologies for the production of GaAs solar cells on GaAs and other substrates. Three subjects were gone into on particular: Material preparation (epitaxy), solar cell technology, characterisation of materials and processes. (orig.)

684 (NREL/TP–411-7170) **Silicon-Film™ photovoltaic manufacturing technology: Semiannual subcontract report, 15 October 1993–15 April 1994.** Collins, S.R. (AstroPower, Inc., Newark, DE (United States)); Hall, R.B. National Renewable Energy Lab., Golden, CO (United States); AstroPower, Inc., Newark, DE (United States). Sep 1994. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94011899. Source: OSTI; NTIS; GPO Dep.

This report describes work to develop an advanced, low-cost manufacturing process for a now utility-scale, flat-plate module. This process starts with the production of continuous sheets of thin-film, polycrystalline silicon using the Silicon-Film™ process. Sheets are cut into wafers that are nominally 15 cm on a side. Fifty-six of these wafers are then fabricated into solar cells that are strung together into a 170-W module. Twelve of these modules form a 2-kW array. The program has three main components: (1) development of a Silicon-Film™ wafer machine that is capable of manufacturing waters that are 225 cm^2 in size at a rate of 3.0 MW/yr, with a total product cost reduction of 70%; (2) development of an advanced solar cell manufacturing process that is capable of turning the Silicon-Film™ wafer into a 3.25-W solar cell; and (3) development of an advanced module design based on these large-area silicon solar cells with an average power of 170 W for 56 solar cells and 113 W for 36 solar cells.

685 (NREL/TP–411-7190) **Research on stable, high-efficiency amorphous silicon multijunction modules: Final subcontract report, 1 January 1991–31 August 1994.** Guha, S. (United Solar Systems Corp., Troy, MI (United States)). National Renewable Energy Lab., Golden, CO (United States); United Solar Systems Corp., Troy, MI (United States). Oct 1994. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000215. Source: OSTI; NTIS; GPO Dep.

The principal objective of this program is to conduct research on semiconductor materials and non-semiconductor materials to enhance the performance of multibandgap, multijunction, large-area

amorphous silicon-based alloy modules. The goal for this program is to demonstrate stabilized module efficiency of 12% for multijunction modules of area greater than 900 cm^2. Double-junction and triple-junction cells are made on Ag/ZnO back reflector deposited on stainless steel substrates. The top cell uses a-Si alloy; a-SiGe alloy is used for the i layer in the middle and the bottom cells. After evaporation of antireflection coating, silver grids and bus bars are put on the top surface, and the panel is encapsulated in an ethylene vinyl acetate (EVA)/Tefzel structure to make a one-square-foot monolithic module.

686 (NREL/TP–411-7350) **Large-area triple-junction a-Si alloy production scaleup: Annual subcontract report, 17 March 1993–18 March 1994.** Oswald, R. (Solarex Corp., Newtown, PA (United States). Thin Film Div.); Morris, J. National Renewable Energy Lab., Golden, CO (United States); Solarex Corp., Newtown, PA (United States). Thin Film Div. Nov 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000245. Source: OSTI; NTIS; GPO Dep.

The objective of this subcontract over its three-year duration is to advance Solarex's photovoltaic manufacturing technologies, reduce its a-Si:H module production costs, increase module performance and expand the Solarex commercial production capacity. Solarex shall meet these objectives by improving the deposition and quality of the transparent front contact, by optimizing the laser patterning process, scaling-up the semiconductor deposition process, improving the back contact deposition, scaling-up and improving the encapsulation and testing of its a-Si:H modules. In the Phase 2 portion of this subcontract, Solarex focused on improving deposition of the front contact, investigating alternate feed stocks for the front contact, maximizing throughput and area utilization for all laser scribes, optimizing a-Si:H deposition equipment to achieve uniform deposition over large-areas, optimizing the triple-junction module fabrication process, evaluating the materials to deposit the rear contact, and optimizing the combination of isolation scribe and encapsulant to pass the wet high potential test. Progress is reported on the following: Front contact development; Laser scribe process development; Amorphous silicon based semiconductor deposition; Rear contact deposition process; Frit/bus/wire/frame; Materials handling; and Environmental test, yield and performance analysis.

687 (NREL/TP–451-6638) **Advanced processing technology for high-efficiency, thin-film $CuInSe_2$ and CdTe solar cells: Annual subcontract report, 1 March 1993–28 February 1994.** Morel, D.L. (University of South Florida, Tampa, FL (United States)); Ferekides, C.S. National Renewable Energy Lab., Golden, CO (United States); University of South Florida, Tampa, FL (United States). Dept. of Electrical Engineering. Jul 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94011838. Source: OSTI; NTIS; GPO Dep.

This annual report details activities in research on advanced processing technology for high-effiency, thin-film solar cells.

688 (NREL/TP–451-7162) **Thin-film cadmium telluride photovoltaic cells: Final subcontract report, 1 November 1992–1 January 1994.** Compaan, A.D. (Toledo Univ., OH (United States)); Bohn, R.G. National Renewable Energy Lab., Golden, CO (United States); Toledo Univ., OH (United States). Sep 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94011886. Source: OSTI; NTIS; GPO Dep.

This report describes work to develop and optimize radio-frequency (rf) sputtering for the deposition of thin films of cadmium telluride (CdTe) and related semiconductors for thin-film solar cells. Pulsed laser physical vapor deposition was also used for exploratory work on these materials, especially where alloying or doping are involved, and for the deposition of cadmium chloride layers. The sputtering work utilized a 2-in diameter planar magnetron sputter gun. The film growth rate by rf sputtering was studied as a function of substrate temperature, gas pressure, and rf power. Complete solar cells were fabricated on tin-oxide-coated soda-lime glass substrates. Currently, work is being done to improve the open-circuit voltage by varying the CdTe-based absorber layer, and to improve the short-circuit current by modifying the CdS window layer.

689 (NREL/TP–451-7166) **Growth and development of GaInAsP for use in high-efficiency solar cells: Final subcontract report, 1 July 1991–30 December 1993.** Sharps, P.R. (Research Triangle Inst., Research Triangle Park, NC (United States)). National Renewable Energy Lab., Golden, CO (United States); Research Triangle Inst., Research Triangle Park, NC (United States). Oct 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE94000210. Source: OSTI; NTIS; GPO Dep.

This report describes accomplishments during Phase 3 of this subcontract. The overall goals of the subcontract were (1) to develop the necessary technology to grow high-efficiency GaInAsP layers that are lattice-matched to GaAs and Ge; (2) to demonstrate highefficiency GaInAsP single-junction solar cells; and (3) to demonstrate GaInAsP/Ge cascade solar cells suitable for operation under concentrated (500X) sunlight. The major accomplishments during Phase 3 include (1) demonstrating a GaInAsP tunnel diode for use as an interconnect in the GaInAsP/Ge cascade cell, and (2) demonstrating a GaInAsP/Ge cascade cell. The development of the GaInAsP tunnel diode is a major accomplishment because it allows for the GaInAsP and Ge cells to be connected without optical losses for the bottom Ge cell, such as a Ge tunnel diode would cause. The GaInAsP/Ge cascade cell development is significant because of the demonstration of a cascade cell with a new materials system.

690 (NREL/TP–451-7189) **Polycrystalline $CuInSe_2$ and CdTe PV solar cells: Annual subcontract report, 15 April 1993–14 April 1994.** Dhere, N.G. (Florida Solar Energy Center, Cape Canaveral, FL (United States)). National Renewable Energy Lab., Golden, CO (United States); Florida Solar Energy Center, Cape Canaveral, FL (United States). Nov 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000244. Source: OSTI; NTIS; GPO Dep.

This is an annual technical report on the Phase 2 of a three-year phased research program. The principal objective of the research project is to develop novel and low-cost processes for the fabrication of stable and efficient $CuIn_{1-x}Ga_xSe_2$ and CdTe polycrystalline-thin-film solar cells using reliable techniques amenable to scale-up for economic, large-scale manufacture. The aims are to develop a process for the non-toxic selenization so as to avoid the use of extremely toxic H_2Se in the fabrication of $CuIn_{1-x}Ga_xSe_2$ thin-film solar cells; to optimize selenization parameters; to develop a process for the fabrication of CdTe solar cells using Cd and Te layers sputtered from elemental targets; to develop an integrated process for promoting the interdiffusion between Cd/Te layers, CdTe phase formation, grain growth, type conversion, and junction formation; to improve adhesion; to minimize residual stresses; to improve the metallic back-contact; to improve the uniformity, stoichiometry, and morphology of $CuIn_{1-x}Ga_xSe_2$ and CdTe thin films; and to improve the efficiency of $CuIn_{1-x}Ga_xSe_2$ and CdTe solar cells.

691 (SAND–94-2068) **Development of concentrator solar cells.** Sandia National Labs., Albuquerque, NM (United States); Applied Solar Energy Corp., City of Industry, CA (United States). Aug 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002316. Source: OSTI; NTIS; GPO Dep.

A limited pilot production run on PESC silicon solar cells for use at high concentrations (200 to 400 suns) is summarized. The front contact design of the cells was modified for operation without prismatic covers. The original objective of the contract was to systematically complete a process consolidation phase, in which all the, process improvements developed during the contract would be combined in a pilot production run. This pilot run was going to provide, a basis for estimating cell costs when produced at high throughput. Because of DOE funding limitations, the Photovoltaic Concentrator Initiative is on hold, and Applied Solar's contract was operated at a low level of effort for most of 1993. The results obtained from the reduced scope pilot run showed the effects of discontinuous process optimization and characterization. However,

the run provided valuable insight into the technical areas that can be optimized to achieve the original goals of the contract.

692 (SAND–94-2453) **Si concentrator solar cell development: [Final report].** Krut, D.D. (Spectrolab, Inc., Sylmar, CA (United States)). Sandia National Labs., Albuquerque, NM (United States); Spectrolab, Inc., Sylmar, CA (United States). Oct 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002314. Source: OSTI; NTIS; GPO Dep.

This is the final report of a program to develop a commercial, high-efficiency, low-cost concentrator solar cell compatible with Spectrolab's existing manufacturing infrastructure for space solar cells. The period covered is between 1991 and 1993. The program was funded through Sandia National Laboratories through the DOE concentrator initiative and, was also cost shared by Spectrolab. As a result of this program, Spectrolab implemented solar cells achieving an efficiency of over 19% at 200 to 300X concentration. The cells are compatible with DOE guidelines for a cell price necessary to achieve a cost of electricity of 12 cents a kilowatthour.

1406 Photovoltaic Power Systems

Refer also to citation(s) 904, 929, 1079

693 (ETDE/DE-mf–95716365) **Photovoltaic power plant for the partial supply of the new training center of the Hamburgische Electricitaets-Werke AG: Final report.** Juergens, U. Hamburgische Electricitaets-Werke AG, Hamburg (Germany). 1992. 84p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0329005A. Order Number DE95716365. Source: OSTI; NTIS (US Sales Only).

For the use of renewable energy sources a photovoltaic power system has been installed at the 132 m long south facade of the new two-storey training center of the Hamburgische Electricitaetswerke AG. A solar generator with a total output of 16.8 kWp was installed. The electric power produced by the solar generator is supplied to the local low-voltage network via a line commutated three-phase inverter. The system was put into operation on the 24th November 1989. Since the second half of 1991 the photovoltaic system operates trouble-free. (orig./HW). 10 figs.

694 (SAND–94-2498C) **Highlights of recent balance of system research and evaluation.** Thomas, M.G.; Stevens, J.W. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409170–1: Photovoltaic performance and reliability workshop, Lakewood, CO (United States), 21-23 Sep 1994). Order Number DE95001626. Source: OSTI; NTIS; GPO Dep.

The cost of most photovoltaic (PV) systems is more a function of the balance of system (BOS) components than the collectors. The exception to this rule is the grid-tied system whose cost is related more directly to the collectors, and secondarily to the inverter/controls. In fact, recent procurements throughout the country document that collector costs for roof-mounted, utility-tied systems (Russell, PV Systems Workshop, 7/94) represent 60% to 70% of the system cost. This contrasts with the current market for packaged stand-alone all PV or PV-hybrid systems where collectors represent only 25% to 35% of the total. Not only are the BOS components the cost drivers in the current cost-effective PV system market place, they are also the least reliable components. This paper discusses the impact that BOS issues have on component performance, system performance, and system cost and reliability. We will also look at recent recommended changes in system design based upon performance evaluations of fielded PV systems.

1407 Solar Thermal Power Systems

Refer also to citation(s) 706

1409 Solar Thermal Utilization

Refer also to citation(s) 1037

695 (CONF-921104–16) **Solar concentration/destruction of pesticide rinsewater.** Salladay, D.G.; Ash, D.H.; Sullivan, J.M.; Grinstead, J.H. Jr.; Hemmen, J.E. National Fertilizer and Environmental Research Center, Muscle Shoals, AL (United States). Sep 1992. 22p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–352). From American Institute of Chemical Engineers annual meeting; Miami, FL (United States); 1-6 Nov 1992. Order Number DE95001729. Source: OSTI; NTIS; INIS.

To address a growing national problem with generation of wastes and by-products, TVA has been involved for several years with developing and commercializing environmentally responsible practices for eliminating, minimizing, or utilizing various wastes/by-products. In many cases, reducing waste generation is impractical, but the wastes/by-products can be converted into other environmentally sound products. In some instances, conversion to safe, value-added agricultural products is the best or only practical alternative. TVA is currently involved with a diversity of projects converting wastes/by-products into safe, economical, and agriculturally beneficial products. Environmental improvement projects have involved poultry litter, cellulosic wastes, used battery acid, ammonium sulfate fines, lead smelting effluents, deep-welled sulfuric acid/ammonium bisulfate solutions, wood ash, waste magnesium ammonium sulfate slurry from recording tape production, and ammunition plant waste sodium nitrate/ammonium nitrate streams.

696 (DOE/CE/15479–T6) **Final report - Sundyne Company.** Long, J.B. Sundyne Co., Sarasota, FL (United States). 27 Sep 1994. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-90CE15479. Order Number DE95001811. Source: OSTI; NTIS; GPO Dep.

Solar cookers offer a viable alternative to conventional cooking methods in many areas, and can be an effective tool in the fight against the deforestation and desertification that plague many developing countries. However, there have been numerous obstacles to the successful dissemination of solar cookers in the past. The purpose of this paper is to identify opportunities, review constraints and develop a marketing strategy to disseminate the Sundyne Solar Cooker (SSC) in developing countries.

697 (NEI-DK–1644) **Solar energy in building renovation: Working documents - Denmark. Feasibility study phase. National participation plan. Solar renovation potential. Case studies. Introduction to solar walls.** Joergensen, O.B.; Kristensen, P.E.; Soerensen, H. Esbensen Raadgivende Civilingenioerer, Virum (Denmark). Mar 1994. 25p. Contract ENS-16143/20-0001. Order Number DE95707349. Source: OSTI; NTIS. EFP-92.

The documentation of the results of the Danish effort related to the feasibility study phase for a project ranging under the International Energy Agency (IEA) Solar Heating and Cooling Programme designated 'Task 20, Solar Energy in Building Renovation' is presented under the headings of National Participation Plan, Solar Renovation Potential, Case Studies and Introduction to Solar Walls. (AB)

698 (NEI-DK–1644, pp. 10-19) **Results from retrofitting with transparent insulation on three different residential houses in Denmark.** Bruun Joergensen, O. (Esbensen, Consulting Engineers, Copenhagen (Denmark)). Esbensen Raadgivende Civilingenioerer, Virum (Denmark). Mar 1994. Contract ENS-16143/20-0001. In *Solar energy in building renovation: Working documents - Denmark. Feasibility study phase. National participation plan. Solar renovation potential. Case studies. Introduction to solar walls.* 25p. Order Number DE95707349. Source: OSTI; NTIS. EFP-92.

A cost effective hybrid passive solar system for glass covering of concrete balconies in need of repair has been developed. Low performance inexpensive solar walls and more expensive high performance solar walls have shown that retrofitting of facades using unventilated solar walls could become an attractive alternative to retrofitting with conventional exterior opaque insulation. (au)

699 (NEI-DK–1648) **Measurement and evaluation of combined solar heating system for space and water heating at Egebjerggaard 3 (Skotteparken).** Balslev-Olesen, O.; Vejsig Pedersen, P. Cenergia ApS, Ballerup (Denmark). Jun 1994. 28p.

(In Danish). Contract ENS-51181-92.0059. Order Number DE95707289. Source: OSTI; NTIS.

The aim was to reduce fuel consumption by 60% in apartment buildings containing 100 homes in Ballerup, Denmark. The solar heating system and pulse operation of the district heating supply are described and the results of one year's measurement are presented. The solar system provides indoor heating and heats the domestic water. The heat storage tank for the solar heat acts as a buffer for the district heating and in this way a reduction of heat loss from the solar heating system is achieved. The total heat saving connected with the solar heating system and pulse operation was 195.000 kWh answering to a capacity of 390 kWh per square meter. The return temperature in the district heating distribution network is low as a consequence of the design of this overall system. (AB)

700 (NEI-DK–1668) **Combined heat pump and solar heating system for villas: Phase 1.** Aagaard, H.C. Dansk Teknologisk Inst., Taastrup (Denmark). Proevestationen for Varmepumpeanlaeg. Dec 1993. 38p. (In Danish). Contract ENS-51191-92.0047. Order Number DE95707361. Source: OSTI; NTIS.

The aim was to demonstrate that it is possible to install, in individual houses, combined solar heating and heat pump systems that are economically attractive and energy saving. Environmental impacts would be positive and operational costs could lead to increase of export, underground tubes could be shortened, efficiency and capacity would be considerably increased and too-high temperatures in the solar collector would be avoided. The calculations and dimensioning, installation, regulation and measuring of the system are very briefly described. Results were satisfactory, Information on current Danish prices is given. (AB)

701 (SAND–94-2432C) **The U.S. Department of Energy's role in commercialization of solar thermal electric technology.** Burch, G.D. (United States Dept. of Energy, Washington, DC (United States)); Tyner, C.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940970–2: 7. international symposium on solar thermal concentrating technologies, Moscow (Russian Federation), 26-30 Sep 1994). Order Number DE95001624. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Energy (DOE) has supported the development of solar thermal electric (STE) technology since the early 1970s. From its inception, the program has held a long-term goal of nurturing STE technologies from the research and development (R&D) stage through technology development, ultimately leading to commercialization. Within the last few years, the focus of this work -has shifted from R&D to cost-shared cooperative projects with industry. These projects are targeted not just at component development, but at complete systems, marketing approaches, and commercialization plans. This changing emphasis has brought new industry into the program and is significantly accelerating solar thermal's entry into the marketplace. Projects such as Solar Two in the power tower area, a number of dish/Stirling joint ventures in the modular power area, and operations and maintenance (O&M) cost reduction studies will be discussed as examples of this new focus.

702 (SAND–94-2437C) **Recent National Solar Thermal Test Facility activities, in partnership with industry.** Ghanbari, C. (Sandia National Labs., Albuquerque, NM (United States)); Cameron, C.P.; Ralph, M.E.; Pacheco, J.E.; Rawlinson, K.S.; Evans, L.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940970–5: 7. international symposium on solar thermal concentrating technologies, Moscow (Russian Federation), 26-30 Sep 1994). Order Number DE95001828. Source: OSTI; NTIS; GPO Dep.

The National Solar Thermal Test Facility (NSTTF) at Sandia National Laboratories in Albuquerque, New Mexico, USA conducts testing of solar thermal components and systems, funded primarily by the US Department of Energy. Activities are conducted in support of Central Receiver Technology, Distributed Receiver Technology and Design Assistance projects. All activities are performed in support of various cost-shared government/industry joint ventures and, on a design assistance basis, in support of a number of other industry partners.

1410 Solar Collectors and Concentrators

Refer also to citation(s) 694, 702

703 (ETDE/DE-mf–95708532) **Control of the collector outlet temperature at the solar test plant TESOP: Structural approximation of the point-to-point transmission function. Final report.** Obertopp, T.; Schaffner, J.; Zeitz, M. Stuttgart Univ. (Germany). Inst. fuer Systemdynamik und Regelungstechnik. 8 Oct 1992. 45p. (In German). Sponsored by Deutsche Forschungsanstalt fuer Luft- und Raumfahrt e.V. (DLR), Stuttgart (Germany);Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03E8656A. Order Number DE95708532. Source: OSTI; NTIS (US Sales Only).

In order to control the collector outlet temperature at the parabolic trough collector of the solar collector text plant TESOP, the dynamic behaviour of the control section is investigated. The control concept is based on the transmission characteristics of the collector system as a whole, which can be calculated from the transmission functions of the supply line and collector. After a comparison of reference and approximations in the frequency range, also the time range characteristics are investigated. (orig./BWI)

704 (ETDE/DE-mf–95711745) **Development and testing of an integrated collector-latent heat storage for solar service water heating: Final report.** Malatidis, N.A.; Schuler, M.; Fisch, N.M. Stuttgart Univ. (Germany). Inst. fuer Thermodynamik und Waermetechnik. 1991. 24p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328862A. Order Number DE95711745. Source: OSTI; NTIS (US Sales Only).

In the scope of the research project presented, the application of a phase commutating material in an integrated storage module for solar service water heating is to be investigated. By means of a laboratory module the thermal transport procedures in the inner of the system within loading and discharging tests are studied. In addition, a calculation model is established and validated by means of measurements. Finally, short-time measurements of a prototype in open air ground test plants facilitate the determination of an input/output diagram and an extrapolation of the annual yield for reference climatic data. Parallel to the work on the collector storage module, material data of further phase commutating materials are determined which can be applied in IKS systems. (orig.)

705 (ETDE/DE-mf–95716211) **Control of the collector outlet temperature at a solar collector test stand: Study.** Obertopp, T. Stuttgart Univ. (Germany). Inst. fuer Systemdynamik und Regelungstechnik. 1992. 96p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03E8656A. Order Number DE95716211. Source: OSTI; NTIS (US Sales Only).

The solar power plant TESOP at the "Deutsche Forschungsanstalt fuer Luft- und Raumfahrt (DLR)" in Stuttgart is the starting point of this paper. The task was to design the control of the outlet temperature at the distributed collector system of this plant. For the control of the outlet temperature two inputs are available, i.e. the flow of the fluid and the inlet temperature of the fluid. We design a regulator by means of linear methods. The linearization is in some cases too simple; thus another design method based on the nonlinear distributed model of the plant is presented. All the examinations stressed the transferability of the results to bigger installations. They will be the basis for further studies in the control engineering of distributed collectors. (orig./HW)

706 (SAND–94-1245C) **Testing of the SAIC facets on the stretched-membrane dish.** Grossman, J.W. (Sandia National Labs., Albuquerque, NM (United States)); Erdman, W.W.; Houser, R.M.; Davenport, R. Sandia National Labs., Albuquerque, NM (United States). Apr 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9403170–1: 1995 American Society of Mechanical Engineers/Japanese Society of Mechanical Engineers/Japan Solar

Energy Society (ASME/JSME/JSES) international solar energy conference, Maui, HI (United States), 19-24 Mar 1994). Order Number DE95001831. Source: OSTI; NTIS; GPO Dep.

A dish structure sized for a 25 kW electric dish/generator system has been installed at the National Solar Thermal Test Facility (NSTTF). The dish is used as an optical test bed for prototype stretched-membrane facets. Sandia procured twelve (12) stretched-membrane facets from Science Applications International Corporation (SAIC) for installation on the dish structure. Individual facet optical performance was measured using the 2f test method under development at Sandia. Four facets were tested on-sun using the test truss at the NSTTF prior to installation on the dish structure. During the final stages of the structure assembly, the facets were installed for testing. A distant light source alignment technique was used to align the facets to a 9 meter focal length. The alignment and focus were optimized with on-sun measurements of individual facet characteristics. On-sun flux maps of the image were made using the Beam Characterization System. Calorimetry tests were performed using a cold water calorimeter. This data was used to create a power intercept curve and predict the power inside apertures of different sizes. The focal plane was moved to 9.95 meters and the alignment, optimization, and on-sun tests repeated. This paper presents the results of the testing on the individual facets as well as the results of testing the dish system. The effects of the change in focal length on the optical performance of the dish are shown in the results.

707 (SAND–94-1758C) **Recent reflux receiver developments under the US DOE program.** Andraka, C.E.; Diver, R.B.; Moreno, J.B.; Moss, T.A.; Adkins, D.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940970–3: 7. international symposium on solar thermal concentrating technologies, Moscow (Russian Federation), 26-30 Sep 1994). Order Number DE95001622. Source: OSTI; NTIS; GPO Dep.

The United States Department of Energy (DOE) Solar Thermal Program, through Sandia National Laboratories (SNL), is cooperating with industry to commercialize dish-Stirling technology. Sandia and the DOE have actively encouraged the use of liquid metal reflux receivers in these systems to improve efficiency and lower the levelized cost of electricity. The reflux receiver uses two-phase heat transfer as a "thermal transformer" to transfer heat from a parabolic tracking-concentrator to the heater heads of the Stirling engine. The two-phase system leads to a higher available input temperature, lower thermal stresses, longer life, and independent design of the absorber and engine sections. Two embodiments of reflux receivers have been investigated: Pool boilers and heat pipes. Several pool-boiler reflux receivers have been successfully demonstrated on sun at up to 64 kWt throughput at SNL. In addition, a bench-scale device was operated for 7500 hours to investigate materials compatibility and boiling stability. Significant progress has also been made on heat pipe receiver technology. Sintered metal wick heat pipes have been investigated extensively for application to 7.5 kWe and 25 kWe systems. One test article has a massed over 1800 hours of on-sun operation. Another was limit tested at Sandia to 65 kWt throughput. These devices incorporate a nickel-powder thick wick structure with condensate return directly to the wick surface. Circumferential tubular arteries are optionally employed to improve the operating margin. In addition, DOE has begun a development program for advanced wick structures capable of supporting the Utility Scale Joint Venture Program, requiring up to 100 kWt throughput. Promising technologies include a brazed stainless steel powdered metal wick and a stainless steel metal felt wick. Bench-scale testing has been encouraging, and on-sun testing is expected this fall. Prototype gas-fired hybrid solar receivers have also been.

708 (SAND–94-2431C) **An overview: Component development for solar thermal systems.** Mancini, T.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940970–1: 7. international symposium on solar thermal concentrating technologies, Moscow (Russian Federation), 26-30 Sep 1994). Order Number DE95001623. Source: OSTI; NTIS; GPO Dep.

In this paper, I review the significant issues and the development of solar concentrators and thermal receivers for central-receiver power plants and dish/engine systems. Due to the breadth of the topic area, I have arbitrarily narrowed the content of this paper by choosing not to discuss line-focus (trough) systems and energy storage. I will focus my discussion on the development of heliostats, dishes, and receivers since the 1970s with an emphasis on describing the technologies and their evolution, identifying some key observations and lessons learned, and suggesting what the future in component development may be.

1420 Heat Storage

Refer also to citation(s) 704

15 GEOTHERMAL ENERGY

1502 Geology and Hydrology of Geothermal Systems

Refer also to citation(s) 713

1503 Geothermal Exploration and Exploration Technology

709 (DOE/AL/73394–T1-Exec.Summ.) **Alpine 1/Federal: Executive summary final report.** Witcher, J.C. (New Mexico State Univ., Las Cruces, NM (United States). Southwest Technology Development Inst.). Arizona Energy Office, Phoenix, AZ (United States). Apr 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-91AL73394. Order Number DE94017948. Source: OSTI; NTIS; GPO Dep.

This summary report overviews a State of Arizona and US Department of Energy funded drilling project to determine if near-term hot dry rock (HDR) geothermal potential exists in the eastern portion of the White Mountains region of Arizona. A 4,505 feet deep slim-hole exploratory well, Alpine1/Federal, was drilled within the Apache-Sitgreaves National Forest at Alpine Divide near the Alpine Divide camp ground about 5 miles north of Alpine, Arizona in Apache County (Figure 1). A comprehensive technical report, in two parts, details the results of the project. Part 1, Alpin1/Federal, Drilling Report discusses the drilling operations, logging program, permitting and site selection for the hole. Part 2, Temperature Gradients, Geothermal Potential, and Geology, summarizes the temperature gradients, heat flow, geothermal potential, and subsurface geology.

710 (DOE/AL/73394–T1-Pt.2) **Alpine 1/Federal: Temperature gradients, geothermal potential, and geology: Final report, Part 2.** Witcher, J.C. (New Mexico State Univ., Las Cruces, NM (United States). Southwest Technology Development Inst.); Hahman, W.R.; Swanberg, C.A. Arizona Energy Office, Phoenix, AZ (United States). Jun 1994. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-91AL73394. Order Number DE94017950. Source: OSTI; NTIS; GPO Dep.

The Alpine 1/Federal drilling project provided valuable new; information on the geology of the region. Except for drilling into Precambrian rocks, the objectives of the project were accomplished. sufficient temperature and heat-flow information were obtained to assess the near-term HDR geothermal potential of the eastern White Mountains region. Therefore, the primary mission of the project was successful. The HDR potential for near-term electrical power production is not economic. Potential for HDR direct-use space heating is marginal at best and should realistically be considered uneconomic. The Alpine 1/Federal hole should be deepened to Precambrian basement to provide definitive subsurface geological information for this region. Deeper drilling will determine Precambrian lithology and assess if older Paleozoic rock units are present. The hole may be deepened with a BQ drill

string. Depth to Precambrian is likely to be between 800 and 2,000 feet below the current 4,505 feet total depth. The failure to reach Precambrian basement due to a previously unknown and unmapped major structural offset highlights the need for detailed surface geological mapping in this poorly understood region.

711 (ETDE/JP-mf–95714824) **Technological verification of geothermal exploration in 1992.: Development of fractured reservoir exploration and electromagnetic wave-utilizing exploration (development of array CSMT).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1993. 138p. (In Japanese). Order Number DE95714824. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

An efficient array CSMT (Controlled Source Magnetotellurics) survey system was developed to explore, very accurately on the ground surface, the geothermal reservoir-related fractured zone. Survey stations were set in array on the survey line with an artificial signal transmitter. A 16-channel system was experimentally prepared which could accurately and stably receive even very weak signals. Improvement was made in automatic frequency-switching function and operational performance. Software was also improved in data processing, analysis and display. An application experiment was conducted in Sengan area where the existence of a fractured geothermal reservoir was confirmed. The experimentally obtained resistivity was compared with that from the already known geological structure and logging data. In the survey area, measurement was made at 342 stations set up, with an interval of 50m, on twelve 1.4km-long parallel survey lines. In the above CSMT survey area, a high accuracy MT survey was also conducted at 42 stations. Though the area was comparatively high in noise level, good data could be obtained. In Sengan area, the resistivity structure is divided into three layers, i.e, highly resistive overburden, extremely low resistivity intermediate layer and medium resistivity deep layer. Several detected low resistivity zones which express the geothermal alteration reflect the fractured structure and altered zone. 13 refs., 32 figs., 7 tabs.

712 (SAND–94-0551) **Steamboat Hills exploratory slimhole: Drilling and testing.** Finger, J.T.; Jacobson, F.D.; Hickox, C.E.; Eaton, R.R. Sandia National Labs., Livermore, CA (United States). Oct 1994. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002956. Source: OSTI; NTIS; GPO Dep.

During July-September, 1993, Sandia National Laboratories, in cooperation with Far West Capital, drilled a 4000 feet exploratory slimhole (3.9 inch diameter) in the Steamboat Hills geothermal field near Reno, Nevada. This well was part of Sandia's program to evaluate slimholes as a geothermal exploration tool. During and after drilling the authors performed four series of production and injection tests while taking downhole (pressure-temperature-spinner) and surface (wellhead pressure and temperature, flow rate) data. In addition to these measurements, the well's data set includes: continuous core (with detailed log); borehole televiewer images of the wellbore's upper 500 feet; daily drilling reports from Sandia and from drilling contractor personnel; daily drilling fluid record; numerous temperature logs; and comparative data from production and injection wells in the same field. This report contains: (1) a narrative account of the drilling and testing, (2) a description of equipment used, (3) a brief geologic description of the formation drilled, (4) a summary and preliminary interpretation of the data, and (5) recommendations for future work.

713 (UCRL-JC–117285) **Microearthquake monitoring and seismic imaging at The Geysers.** Zucca, J.J. (Lawrence Livermore National Lab., CA (United States)); Hutchings, L.; Bonner, B.; Kasameyer, P.; Majer, E.L.; Peterson, J.; Romero, A.; Kirkpatrick, A. Lawrence Livermore National Lab., CA (United States). Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9404102–7: 12. geothermal program review: geothermal's role in global climate change - impacts on the Climate Change Action Plan, San Francisco, CA (United States), 25-28 Apr 1994). Order Number DE95002391. Source: OSTI; NTIS; GPO Dep.

We are monitoring two high-frequency, high-resolution microearthquake networks at The Geysers. The first network consists of 16 stations and is located in the northwest portion of the Geysers. This array is in an area that is representative of a high-temperature, deep, reservoir environment. The second network consists of 13 stations located in the southeast Geysers around the location of the cooperative injection experiment. We are using the data from the networks to compute velocity and attenuation images and earthquake parameters such as precise location and rate and manner of energy release. Our goal is to evaluate the use of this information to manage steam release from geothermal reservoirs. We are supporting this effort with laboratory measurements of velocity and attenuation on Geysers core samples under varying degrees of saturation to help us better interpret our seismic images. To date we find that microearthquake activity follows injection activity, and the dry, low-pressure portions of the reservoir are characterized by low velocity and high attenuation.

1505 Economic, Industrial, and Business Aspects

714 (DOE/EIS–0207) **Newberry Geothermal Pilot Project.** USDOE Bonneville Power Administration, Portland, OR (United States). Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001766. Source: OSTI; NTIS; GPO Dep.

BPA has decided to acquire 20 average megawatts (aMW) of electrical power from a privately-owned geothermal power plant on the west flank of Newberry Volcano in Deschutes County, Oregon. The Newberry Project will generate 30 aMW and will be developed, owned, and operated by CE Newberry, Inc. of Portland, Oregon. In addition, BPA has decided to grant billing credits to EWEB for 10 aMW of electrical power and to provide wheeling services to EWEB for the transmission of this power to their system. BPA expects the Newberry Project to be in commercial operation by November 1997. BPA has statutory responsibilities to supply electrical power to its utility industrial and other customers in the Pacific Northwest. The Newberry Project will be used to meet the electrical power supply obligations of these customers. The Newberry Project will also demonstrate the availability of geothermal power to meet power supply needs in the Pacific Northwest and is expected to be the first commercial geothermal plant in the region. The Newberry Project was selected under the BPA Geothermal Pilot Project Program. The goal of the Program is to initiate development of the Pacific Northwest's large, but essentially untapped, geothermal resources, and to confirm the availability of this resource to meet the energy needs of the region. The primary underlying objective of this Program is to assure the supply of alternative sources of electrical power to help meet growing regional power demands and needs.

1506 Environmental Aspects

715 (NEDO-P–9316) **Survey report on geothermal energy development and the environment (landscape). 2.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 201p. (In Japanese). Order Number DE95714832. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In the geothermal energy resource survey, a study being viewed from a landscape aspect was made on proper evaluation of the location and drawing-up of a landscape preservation policy. A, B, and C surveys are conducted for the geothermal energy development promotion; the landscape evaluation is made in B and C surveys where the regions for survey are 50-70 km^2 and 5-10 km^2, respectively, and the two-stage landscape survey is needed according to the progress of the investigation. In the primary landscape survey to grasp landscape characteristics, the survey is to be made for the region of 10 km^2 including that of survey B, and the environmental base information is analyzed using the existing literature and the administrative data published, as a rule. In the computer mesh analytical method, a mesh size is to be 250m. In the secondary landscape survey to evaluate landscape characteristics, separate plans for investigating the present situation are worked out to acquire data on the present situation. The appropriate mesh

size is 50. By this, a large-bore well drilling area which is a future production well base is determined, and a landscape preservation policy is worked out such as an installation plan for the whole geothermal power generation facilities. 13 refs., 35 figs., 27 tabs.

1508 Geothermal Power Plants

Refer also to citation(s) 904

1510 Direct Energy Utilization

716 (DOE/ID/13040–T25) **Geothermal direct-heat utilization assistance: Quarterly project progress report, July 1994–September 1994.** Oregon Inst. of Tech., Klamath Falls, OR (United States). Geo-Heat Center. [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-90ID13040. Order Number DE95001814. Source: OSTI; NTIS; GPO Dep.

This paper is a third quarter 1994 report of activities of the Geo-Heat Center of Oregon Institute of Technology. It describes contacts with parties during this period related to assistance with geothermal direct heat applications. Areas dealt with include geothermal heat pumps, space heating, greenhouses, aquaculture, resources, and equipment. Research is also being conducted on failures of vertical lineshaft turbines in geothermal wells.

17 WIND ENERGY

1701 Resources and Availability (Climatology)

Refer also to citation(s) 721

717 (ANL/ER/CP–82594) **Stability effects on the profiles of vertical velocity and its variance in katabatic flow.** Coulter, R.L.; Martin, T.J. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410222–1: 7. international symposium on acoustic remote sensing and associated techniques of the atmosphere and oceans, Boulder, CO (United States), 3-7 Oct 1994). Order Number DE95001126. Source: OSTI; NTIS; GPO Dep.

The atmospheric katabatic flow in the foothills of the Front Range of the Rocky Mountains has been monitored by a network of towers and sodars for several years as part of the Atmospheric Studies in Complex Terrain (ASCOT) program. The dependence of the vertical component of motion, its variance, and the mean component of the wind perpendicular to the surface at the mouth of Coal Creek Canyon on surface cooling and channeling by winds above the canyon has been explored by using almost three years of data from the network. The magnitude of the near-surface temperature differences was found to decrease with increasing surface cooling in light winds, apparently because of increasing turbulence resulting when increasing winds interact with surface topography. The variance of vertical velocity exhibits three types of vertical profiles, corresponding to different cooling rates and external wind speeds. The mean variance was found to depend strongly on a locally derived Richardson number.

718 (IC–94/166) **Modelling the day to day wind variability offshore central Chile at about 30 deg. south.** Rutllant, J. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 19p. Order Number DE95606032. Source: OSTI; NTIS (US Sales Only); INIS.

Cycles of strengthening and relaxation of the winds offshore 30 degrees S at central Chile, are related to the propagation of coastal-lows, a year-round phenomenon occurring with periodicities of about one in five days. Simple physical modelling of the day to day variability of the alongshore wind component at a coastal strip extending offshore up to the Rossby deformation radius of these wave perturbations, is presented in terms of the relevant horizontal pressure gradients and the ageostrophic components arising from the coastal-low propagation. The results of 5-day composites of 8 wind-events each, at the winter and summer halves of the annual cycle, respectively; lead to a good agreement between the observed phase-lag of the winds with respect to the pressure forcing field, stressing the importance of the ageostrophic wind components at the extremes of the pressure wave perturbation associated with the passage of coastal-lows over the Point Lengua de Vaca (30 15 S) area. A possible contribution of the upwelling-favorable wind enhancement at the time of the pressure rise and subsequent fall, ahead of the coastal-low, is postulated through an upwelling-front low-level jet, that would be carried onshore and closer to the surface by the combination of the enhanced coastal upwelling, the coastal depression of the subsidence inversion base and the coastal ageostrophic wind components during the passage of the leading edge of the coastal lows. (author). 26 refs, 5 figs, 1 tab.

1706 Wind Energy Engineering

Refer also to citation(s) 929

719 (ETDE/DE-mf–95708529) **Field test of a wind-powered vapour compression plant for sea-water desalination in stand-alone operation: Final report.** Coutelle, R.; Gaiser, P.; Kowalczyk, D. Gesellschaft fuer Technische Studien, Entwicklung, Planung mbH (SEP), Muenchen (Germany). Oct 1992. 58p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328486D. Order Number DE95708529. Source: OSTI; NTIS (US Sales Only).

On the North Sea island of Borkum, SEP's sea-water desalination plant based on mechanical vapour compression has been operated at a Stall-controlled wind power station. The aspired dynamic stand-alone operation was realized by a completely new control device. Its design made it possible, that the energy consumption of the desalination plant responds simultaneously to the very rapidly changing electric power production of the TW 45. Furthermore, the heat-transfer from brine and distillate to the feed sea-water via the heat exchangers was improved and integrated into the process control. Since the power production of the wind energy converter could be used completely for sea-water desalination, the specific energy consumption for 1 m^3 distillate surmounts under the instationary conditions in a stand-alone operation the specific energy consumption under stationary conditions by only 10% approx. (orig./HW)

720 (ETDE/DE-mf–95711753) **Choice, examination and test of small wind power stations for developing countries: Final report about the test in Kaiser-Wilhelm-Koog.** Germanischer Lloyd. Bericht, v. WE 31/91. Krabbe, N. (Germanischer Lloyd, Hamburg (Germany)); Rohden, R.; Siebers, T. Germanischer Lloyd, Hamburg (Germany). Nov 1991. 57p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328834A. Order Number DE95711753. Source: OSTI; NTIS (US Sales Only).

Within the scope of this project wind power stations (power range up to 20 kW) and their components pumps and electric generators were tested. The aim is that in future a large part of the plant can be produced and installed in developing countries. Within the framework of the project stability and availability of the wind power plant was gone into. Furthermore control systems and electronic components were tested. (HW)

721 (ETDE/DE-mf–95716327) **German-Chinese cooperation in the field of wind and solar energy: Final report.** Germanischer Lloyd. Bericht, v. WE-51/92. Nath, C. Germanischer Lloyd, Hamburg (Germany). Dec 1992. 27p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0329045A; Foerderkennzeichen BMFT 032914 Order Number DE95716327. Source: OSTI; NTIS (US Sales Only).

The report reviews the German-Chinese cooperation in the field of wind purer. The project comprised the following tasks: Establishment of a testing and tracing center; supply of measuring instruments; training of staff for wind purer systems; servicing of measuring instruments and wind purer plants. (HW)

722 (ILR-Mitt.–287(1994)) **Investigation of different rotor blade forms of wind power plants by means of quasi-steady**

wind tunnel tests. Kaiser, K.; Reuter, A. Technische Univ. Berlin (Germany). Inst. fuer Luft- und Raumfahrt. 1994. 32p. (In German). Order Number DE95707844. Source: OSTI; NTIS (US Sales Only).

In this work are presented the results of performance measurements of three different rotor blades - optimal design, aero tapered and rectangular wing. These results are compared with theoretical predictions. A simple method of measuring is described which produces power curves with a minimal technical effort. The results show that for the optimal design rotor the power curves are fairly in accordance to the numerical predictions, whereas for the aero tapered wing and the rectangular wing the predictions differ clearly from the calculations. (orig.)

723 (NEI-DK–1666) **Fatigue properties and design of wing blades for wind turbines: Final report for the period April 1, 1990 to March 31, 1993.** Andersen, S.I.; Lilholt, H.; Lystrup, Aa. Risoe National Lab., Roskilde (Denmark). Materials Dept. Jan 1994. 85p. Contract JOUR-0071-DK(MB). Order Number DE95707366. Source: OSTI; NTIS.

This project is a continuation of the work on fatigue properties of materials for wingblades, which was carried out in the subproject under the general activity on 'Design-basis for wind turbines' (EC-project No. EN3W.0024). The present project has three main objectives: Fatigue properties of actual and potential materials for wing blades. Performance of root-joints and spar beams for wing blades loaded under fluctuating stresses. Analysis of results and evaluation of norms and standards. Risoe has been active in the first objective and has studied the fatigue properties of composite materials, in particular glass-fibre reinforced polyester. The present series of studies on materials has concentrated on a selection of glass/polyester composites, with various combinations of random fibres and oriented (0 deg.) fibres arranged in well-defined fibre configurations. Besides the improvement of properties by fibre-orientation, it is also possible to consider other fibres or combinations of fibres as a means of increasing stiffness and fatigue strength. It is thus of interest to evaluate the effect of using carbon fibres, of higher stiffness, in combination with glass fibres, of moderate stiffness. Such composite materials are often called hybrid-composites. The study of the fatigue properties of glass/polyester composites has given a wide spectrum of fatigue diagrams under various loading conditions. These diagrams can be used both for comparison of material configurations and for establishing design allowable presumptions. Material parameters have been recorded, like stiffness and hysteresis loops, and these serve as monitoring parameters for the state of damage of the composite materials during fatigue, and they can thus be used in combination with design premises. (EG)

724 (NREL/CP–442-6877) **14th Annual international meeting of wind turbine test stations: Proceedings.** National Renewable Energy Lab., Golden, CO (United States). [1994]. 281p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-9409240–: 14. annual international meeting of wind turbine test stations, Boulder, CO (United States), 12-13 Sep 1994). Order Number DE95000222. Source: OSTI; NTIS; GPO Dep.

These proceedings are of the 14th Annual International Meeting of Test Stations. As the original charter states these meetings are intended to be an international forum for sharing wind turbine testing experiences. By sharing their experiences they can improve testing skills and techniques. As with all new industries the quality of the products is marked by how well they learn from their experiences and incorporate this learning into the next generation of products. The test station's role in this process is to provide accurate information to the companies they serve. This information is used by designers to conform and improve their designs. It is also used by certification agencies for confirming the quality of these designs. By sharing of experiences they are able to accomplished these goals, serve these customers better and ultimately improve the international wind energy industry.

20 FOSSIL-FUELED POWER PLANTS

2001 Power Plants and Power Generation

Refer also to citation(s) 9, 10, 14, 738, 924, 1011, 1469, 1492

725 (CONF-940135–9) **Scale-up and modeling of forced chemical vapor infiltration.** Besmann, T.M. (Oak Ridge National Lab., TN (United States)); McLaughlin, J.C.; Starr, T.L. Oak Ridge National Lab., TN (United States). [1994]. 11p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. From 18. annual conference on composites and advanced ceramics; Cocoa Beach, FL (United States); 9-14 Jan 1994. Order Number DE94017769. Source: OSTI; NTIS; GPO Dep.

The forced flow-thermal gradient chemical vapor infiltration (FCVI) process has been scaled-up from a maximum of 7.6 cm dia. disk to fabrication of 24 cm dia. disks, 1.6 cm in thickness. The components are turbine rotor subelements produced from polar weave Tyranno fibers preforms. The disks were subjected to non-destructive testing and spin-tested to high rpm. The processing conditions were modeled with the GTCVI code to aid in optimization.

726 (DOE/GO–10094-010) **The Utility Battery Storage Systems Program Overview.** National Renewable Energy Lab., Golden, CO (United States). Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. Order Number DE95000201. Source: OSTI; NTIS; GPO Dep.

Utility battery energy storage allows a utility or customer to store electrical energy for dispatch at a time when its use is more economical, strategic, or efficient. The UBS program sponsors systems analyses, technology development of subsystems and systems integration, laboratory and field evaluation, and industry outreach. Achievements and planned activities in each area are discussed.

727 (DOE/MC/29061–3868) **Advanced gas turbine systems research: Quarterly technical progress report, April 1, 1994–June 30, 1994.** Clemson Univ., SC (United States). Jul 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29061. Order Number DE94012293. Source: OSTI; NTIS; GPO Dep.

A cooperative development of gas turbines for electric power generation in USA is underway. Since the first AGTSR program manager has retired, a search for a new manager has begun. Reports during this period include membership, combustion instability white paper, and a summary paper for the ASME IGTI conference.

728 (DOE/MC/29444–3893) **Toms Creek Integrated Gasification Combined-Cycle Demonstration Project: Quarterly report, April–June, 1994.** Feher, G. TAMCO Power Partners, Williamsport, PA (United States). Sep 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC29444. Order Number DE95000017. Source: OSTI; NTIS; GPO Dep.

Several site-specific IGCC heat and material balances were made as part of the analyses of alternate sites for this Clean Coal 4 Demonstration Project. Plant costs were prepared on a factored basis using existing in-house data. Heat and material balances were calculated using the following coal feedstocks: high sulfur bituminous; low sulfur bituminous; and Powder River Basin subbituminous. In addition, the IGCC plant performance was calculated based on G.E.'s frame 6(B) and 6(FA) gas turbines, using the same coal feedstock. Typical heat and material balance calculations results are summarized. The advantages of a more efficient gas turbine on net IGCC heat rates are illustrated. Using high sulfur bituminous coal as feedstock, the G.E. frame 6(FA) gas turbine IGCC plant has a 2–2$\frac{1}{2}$% higher net plant efficiency than that based on a frame 6(B) machine. The reasons are: higher gas turbine efficiency; higher gas turbine exhaust temperature, which allows for higher steam; and temperatures, and a more efficient steam cycle.

729 (DOE/MC/30040–94/C0380) **Fossil fuel conversion–measurement and modeling.** Solomon, P.R.; Smoot, L.D.; Serio, M.A.; Hamblen, D.G.; Brewster, B.S.; Radulovic, P.T. Advanced

Fuel Research, Inc., East Hartford, CT (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30040. (CONF-9406131–62: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE95001756. Source: OSTI; NTIS; INIS; GPO Dep.

The main objective of this program is to understand the chemical and physical mechanisms in coal conversion processes and incorporate this knowledge in computer-aided reactor engineering technology for the purposes of development, evaluation, design, scale-up, simulation, control and feedstock evaluation in advanced coal conversion devices. To accomplish this objective, this program will: (1) provide critical data on the physical and chemical processes in fossil fuel gasifiers and combustors; (2) further develop a set of comprehensive codes; and (3) apply these codes to model various types of combustors and gasifiers (fixed-bed, transport reactor, and fluidized-bed for coal and gas turbines for natural gas).

730 (ETDE/DE-mf–95708584) **VEW-Harpen Kraftwerk Werne oHG. Annual report 1992.** VEW-Harpen Kraftwerk Werne oHG, Werne (Germany). 1993. 24p. (In German). Order Number DE95708584. Source: OSTI; NTIS (US Sales Only).

This company, VEW-Harpen Kraftwerk Werne oHG (KWW) has been operating a 745 MW coal power plant at Werne-Stockum since 1984. KWW is owned by VEW and Harpen. The 1992 annual report contains many financial data, e.g. balance sheet, profit-and-loss account, etc. (orig./UA)

731 (ETDE/DE-mf–95716379) **Combined cycle (CC) power station in the 250-MW power range with integrated coal gasification according to MBG technology: Final report.** Dueerkop, A.; Rost, M. M.A.N. Gutehoffnungshuette GmbH, Oberhausen (Germany). Mar 1988. 53p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326506A. Order Number DE95716379. Source: OSTI; NTIS (US Sales Only).

The combined cycle (CC) process with integrated coal gasification considerably improves the utilization of primary energies whilst also promoting environmental conservation. The present project aims at making the necessary technical preparations for an overall power station concept in the capacity range from 250 to 300 MW using allothermal coal gasification by steam based on MBG technology. Further project activities include thermodynamic cycle calculations with evaluation of results for optimizing overall efficiencies and developing alternative cycle configurations. Capital outlay and electricity generation costs for such a power plant concept are compared to the costs in a conventional power station. (orig.). 8 refs., 6 tabs., 20 figs.

732 (INIS-mf–15066) **There's no way without cooling: All energy conversion processes produce waste heat.** Strombasiswissen, v. 108. Dehli, M. Informationszentrale der Elektrizitaetswirtschaft e.V. (IZE), Frankfurt am Main (Germany). Mar 1992. 4p. (In German). Order Number DE95716325. Source: OSTI; NTIS (US Sales Only); INIS.

The pamphlet in hand is an explanation of the second law of thermodynamics. (DG)

733 (KFK–5316) **Reliability analysis of complex components using the stochastic finite element method.** Reh, S. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung; Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Maschinenbau. Jun 1994. 118p. (In German). Order Number DE95711378. Source: OSTI; NTIS (US Sales Only).

The aim of the present work is the development and investigation of stochastic finite element methods for the calculation of component reliabilities. Different probabilistic methods are used in conjuction with the commerical finite element code ABAQUS. The following probabilistic methods are used: Monte-Carlo method, response surface procedure and the reliability method of first order (FORM). The gradient of specific results of a finite element analysis with respect to scattering input parameters is calculated using the adjoint method. Both, the material properties and the geometrical dimensions of the component are taken into account as scattering input quantities. The procedures developed are applied to analyse the reliability of turbine blades. The stochastic output quantities considered in this study are the deflection and the eigenfrequencies of the turbine blades. (orig.)

2002 Waste Management

Refer also to citation(s) 9, 10, 61, 63, 64, 68, 84, 85, 86, 1047, 1762

734 (ANL/ESD/TM–75) **Cryogenic separation of CO_2 from the flue gas of conventional coal-fired power plants.** Brockmeier, N.F.; Jody, B.J.; Wolsky, A.M.; Daniels, E.J. Argonne National Lab., IL (United States). Energy Systems Div. Oct 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95003029. Source: OSTI; NTIS; GPO Dep.

Several conceptual processes for the capture of CO_2 from power-plant flue gas are listed, with an emphasis on refrigeration and compression as a promising process to compete with amine absorption. At conditions that are industrially achievable (temperature of 170 K and pressure of 5 bar), CO_2 forms a nearly pure solid on cooling from an impure mixed vapor. This study relies on this freezing and purification process to remove 90% or more of the CO_2 from flue gas. Thermal and mechanical integration are used in the conceptual flow sheet to achieve better efficiency. A computerized process simulator, Aspen Plus with Model Manager®, is used to rigorously calculate the material and energy balances for the conceptual process. Key parameters are regressed from the component physical properties of the flue gas and used by the computer in the Peng-Robinson equation of state to quantify the required phase changes of CO_2 solid between vapor and liquid states. Results of process evaluation are given over a range of operating conditions: pressures from 2 to 25 bar and temperatures from 150 to 220 K. This CO_2 separation is shown to be technically feasible by using relatively simple and compact heat-exchange and compression equipment, with an energy requirement of 0.54 kWh/kg CO_2, even without optimization. For comparison, the energy used by state-of-the-art amine absorption is 0.43 kWh/kg. In spite of the 25% higher energy requirement for a cryogenic separation plant, the expectation is that it should have a 4% lower cost per tonne of avoided CO_2 because it is estimated to require a much lower capital investment than amine absorption.

735 (DOE/OR–01-1268/V1-D1) **Remedial Investigation Report on Chestnut Ridge Operable Unit 2 (Filled Coal Ash Pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. Main Text.** Oak Ridge Y-12 Plant, TN (United States). Aug 1994. 563p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001697. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a report on the remedial investigation (RI) of Chestnut Ridge Operable Unit (OU) 2 at the Oak Ridge Y-12 Plant. Chestnut Ridge OU 2 consists of Upper McCoy Branch (UMB), the Filled Coal Ash Pond (FCAP), and the area surrounding the Sluice Channel formerly associated with coal ash disposal in the FCAP. Chestnut Ridge OU 2 is located within the U.S. Department of Energy's (DOE's) Oak Ridge Reservation in Anderson County, Tennessee, approximately 24 miles west of Knoxville. The pond is an 8.5-acre area on the southern slope of Chestnut Ridge, 0.5 mile south of the main Y-12 Plant and geographically separated from the Y-12 Plant by Chestnut Ridge. The elevation of the FCAP is ~ 950 ft above mean sea level (msl), and it is relatively flat and largely vegetated. Two small ponds are usually present at the northeast and northwest corners of the FCAP. The Sluice Channel Area extends ~1000 ft from the northern margin of the FCAP to the crest of Chestnut Ridge, which has an elevation of ~1100 ft above msl. The Sluice Channel Area is largely vegetated also. McCoy Branch runs from the top of Chestnut Ridge across the FCAP into Rogers Quarry and out of the quarry where it runs a short distance into Milton Hill Lake at McCoy Embayment, termed UMB. The portion south of Rogers Quarry, within Chestnut Ridge OU 4, is termed Lower McCoy Branch. The DOE Oak Ridge Y-12 Plant disposed of coal ash from its steam plant operations as a slurry that was discharged into an ash retention impoundment; this impoundment is the FCAP. The FCAP was built in 1955 to serve as a settling basin after coal ash slurried over Chestnut Ridge from the Y-12 Plant.

The FCAP was constructed by building an earthen dam across the northern tributary of McCoy Branch. The dam was designed to hold 20 years of Y-12 steam plant ash. By July 1967, ash had filled up the impoundment storage behind the dam to within 4 ft of the top.

736 (DOE/PC/91343–T6) **IGR NO_x/SO_x control technology: [Progress report], April 1–June 30, 1994.** IGR Enterprises, Inc., Cleveland, OH (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC91343. Order Number DE95002425. Source: OSTI; NTIS; GPO Dep.

During the second quarter of 1994, work was concentrated in several areas critical to the IGR NO_x/SO_x control technology. IGR continued to work on its electrocatalyst materials to improve the electrical efficiency required for economical NO_x/SO_x destruction. The present family of electrocatalyst have voltage, oxygen tolerance and temperature requirements all in the desired ranges, however improved current efficiencies are required for cost-effective NO_x/SO_x destruction. In conjunction with composition modifications, variations in processing conditions were also explored. Secondly, NO_x destruction was quantified between 450°C and 550°C . NO_x destruction was obtained in oxygen levels of up to 5.7% at these temperatures. Finally the first attempt at scale up of this technology was made.

737 (DOE/PC/91346–7) **Development of the integrated environmental control model: Performance and cost models for electrostatic precipitators: Quarterly progress report.** Kalagnanam, J.R.; Rubin, E.S. Carnegie-Mellon Univ., Pittsburgh, PA (United States). Center for Energy and Environmental Studies. 28 Jul 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC91346. Order Number DE95001968. Source: OSTI; NTIS; GPO Dep.

The purpose of this contract is to develop and refine the integrated environmental control model (IECM). In its current configuration, the IECM provides a capability to model various conventional and advanced processes for controlling air pollutant emissions from coal-fired power plants before, during, or after combustion. The principal purpose of the model is to calculate the performance, emissions, and cost of power plant configurations employing alternative environmental control methods. In this report the authors describe the development of analytical models for the performance and costs of high-performance particulate control technologies, focusing on electrostatic precipitators. They pay special attention to developing models which can be used to estimate costs for systems whose performance is up to a factor of three below the present NSPS standards of 0.03 lb/MMBtu. Typically, the cost models relate the capital costs and the operating and maintenance (O and M) costs to process parameters and the costs of labor and materials. The capital cost models are anchored to a base capital cost for a specific size unit and adjusted according to the actual or design parameters. The performance modes are constructed to estimate the process parameters for a desired level of emissions control. The primary motivation for these models is to estimate the costs of complying with environmental standards on a basis reflects recent advances in control technology. Finally, the authors incorporate the uncertainties in various process parameters and inputs costs so as to allow a more rational and robust basis for comparing different technologies. In the following sections the authors discuss the development of the performance and cost models for electrostatic precipitators followed by a numerical example which illustrates the use of these new models.

738 (DOE/PC/92159–T8) **Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994.** Combustion Engineering, Inc., Windsor, CT (United States). 29 Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-92PC92159. Order Number DE95002421. Source: OSTI; NTIS; GPO Dep.

The Pittsburgh Energy Technology Center of the US Department of Energy (DOE) has contracted with Combustion Engineering, Inc. (ABB CE) to perform work on the "Engineering Development of Advanced Coal-Fired Low-Emission Boiler Systems" Project and has authorized ABB CE to complete Phase I on a cost-reimbursable basis. The overall objective of the Project is the expedited commercialization of advanced coal-fired low-emission boiler systems. The specified primary objectives are: NO_x emissions not greater than one-third NSPS; SO_x emissions not greater than one-third NSPS; and particulate emissions not greater than one-half NSPS. The specific secondary objectives are: Improved ash disposability and reduced waste generation; reduced air toxics emissions; increased generating efficiency. The final deliverables are a design data base that will allow future coal-fired power plants to meet the stated objectives and a preliminary design of a commercial generation unit. Technical work was completed in the previous quarter. The final two months of Phase I (July and August 1994) were primarily devoted to the Phase I Report which was submitted in August. This Report constitutes the Technical Proposal for Phase II and III.

739 (DOE/PC/92535–T7) **Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994.** Levendis, Y.A.; Wise, D.L.; Steciak, J. Northeastern Univ., Boston, MA (United States). [1994]. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92535. Order Number DE95002424. Source: OSTI; NTIS; GPO Dep.

The principal objectives of this research are two-fold: (A) To understand the mechanism and assess the effectiveness of sulfur capture by the chemical calcium magnesium acetate (CMA); and (B) To evaluate the NO_x reduction capabilities of CMA by pyrolyzing the organic constituents of the chemical (the acetate) and reducing NO to stable N_2. The optimum conditions and the location of CMA introduction in the furnace will be identified. To achieve these goals water solutions of CMA or dry powders of CMA were injected into hot air or gases simulating the furnace exhaust (containing SO_x, NO_x H_2O, O_2 etc.) and the composition of gaseous and solid products of the reaction was monitored. The processes of burning the organic acetate as well as the calcination, sintering and sulfation of the remaining solid are studied. The effectiveness of "homemade" CMAs containing various amounts of calcium and magnesium was investigated to explore the role of the two chemicals in the NO_x and mainly the SO_2 capture processes. Finally, CMA was introduced in the matrix of coal particles by an ion exchange technique. Upon subsequent combustion, the SO_2-NO_x emissions were monitored and compared to those from burning untreated coal. The composition and physical structure of the ash residues was examined. Both techniques (CMA pretreatment and CMA injection) may commercially be implemented separate or simultaneously. The work reported herein pertains to introducing dry CMA and other carboxylic salts of calcium: calcium formate (CF), calcium acetate (CA), calcium propanate (CP) and calcium benzoate (CB) in the post-flame region of the furnace and monitoring the SO_2 and NO_x, emissions.

2006 Economic, Industrial, and Business Aspects

740 (ETDE/DE-mf–95716322) **STEAG and VEW, Bergkamen joint power plant. Annual report 1992.** Steag und VEW, Gemeinschaftskraftwerk Bergkamen A oHG (Germany). 1993. 24p. (In German). Order Number DE95716322. Source: OSTI; NTIS (US Sales Only).

This company, STEAG and VEW, Gemeinschaftskraftwerk Bergkamen A oHG (GWB), has been operating a 750 MW coal power plant at Bergkamen-Heil since 1981. GWB is owned by VEW and STEAG. The 1992 annual report contains many financial data (balance sheet, profit-and-loss account, etc.). (orig./UA)

21 NUCLEAR POWER REACTORS AND ASSOCIATED PLANTS

Refer also to citation(s) 924, 955, 956, 957

741 (CEA-CONF–11791) **Gamma camera prototype for nuclear installation dismantling.** Carcreff, H.; Marchand, L.; Thellier, G. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Reacteurs Experimentaux. 1993. 8p. (In French). (CONF-9303194–: Meeting on Protection, Handling, Detection and Safety, Strasbourg (France), 30 Mar - 1 apr 1993).

Order Number DE95606749. Source: OSTI; NTIS (US Sales Only); INIS.

This device permits to visualize on the same screen the gamma sources images given by gamma scintillator and the real image in visible light given by a CCD camera. 7 figs.

742 (DPW–56-394) **[Dispersion of fission products].** Menegus, R.L. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 29 Oct 1956. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–781). Order Number DE94017642. Source: OSTI; NTIS; GPO Dep.

This historic report is on letter which details the research into atmospheric dispersion of fissioviable materials in the event of a reactor accident at Savannah River Plant. Graphs are included.

743 (IAEA-TECDOC–756) **Guidelines for multipurpose data systems for nuclear power plants.** International Atomic Energy Agency, Vienna (Austria). Jul 1994. 73p. Order Number DE95603883. Source: OSTI; NTIS (US Sales Only); INIS.

This TECDOC is intended to provide guidance on implementing a system to provide the staff and management of a nuclear power plant with data and information specific to the plant, to assist in making decisions concerning plant operation and maintenance. The guidelines do not deal with issues relating to software and hardware for database management owing to the rapid evolution in these technologies. It will be up to individual utilities to select a suitable technology to meet their data system needs. The guidelines are intended to help a utility with operating plants and/or plants under construction to implement a system which best suits its needs for the compilation of plant specific data. The plant specific data will in turn help in generating quantitative and qualitative results and insights to support decision making for optimized plant operation and maintenance. The guidelines are supplemented by examples of the data systems in use at the utilities that contributed to the preparation of the document. Figs and tabs.

744 (IAEA-TECDOC–757, pp. 15-29) **Principles of decay heat removal in reactor technology - Present status and future prospects.** Kugeler, K. (Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Reliable and safe decay heat removal is one of the main safety requirements in nuclear reactor technology. Today in all plants worldwide this requirement is fulfilled by active decay heat removal systems. If these systems fail, core melt-down accidents can occur and large amounts of fission products can escape to the environment. New developments worldwide are especially discussed toward the question of how to improve reliability in decay heat removal. In this paper some new proposals are described, and the specific safety questions connected with decay heat removal are discussed. It is shown that a concept of self-acting decay heat removal which avoids core melt-down accidents and which guarantees the retention of the fission products inside the fuel elements even if all active decay heat removal systems fail, can indeed be realized. Some technical details of this principle, which has already been realized for high-temperature reactors, are described in this paper. The differences between active, passive and self-acting concepts are explained. Furthermore, some limitations of the concept of self-acting decay heat removal are shown; in addition to the concept of thermal stability of the core guaranteed by the self-acting decay heat removal, there are requirements of neutron physical, chemical and mechanical stability of the core in all accidents. Future work to prove the required principle is discussed at the end of the paper. (author). 22 figs.

745 (IAEA-TECDOC–757, pp. 89-92) **Trends in safety criteria for future reactor plants.** Hicken, E. (Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Design, commissioning and operation of nuclear power plants require safety criteria to achieve a specific safety level. Formally, safety criteria are related to laws, regulations and guidelines. Because in all major countries new criteria are not yet fixed, the term "safety criteria" is used here in a broader sense including views from individuals. Several trends in safety criteria are discussed and justified and approaches to reduce accident dose so that evacuation of the public is not necessary are reviewed. (author).

746 (INIS-mf–14391) **The tolerability of risk from nuclear power stations.** Bezpecnost Jadernych Zarizeni, no.2. Ustav Jadernych Informaci, Prague (Czech Republic). 1994. 53p. Translation of 'The tolerability of risk from nuclear power stations', Health and Safety Executive, London, [1987]. (In Czech). Order Number DE95606515. Source: OSTI; NTIS (US Sales Only); INIS.

Various approaches to safety risks and their tolerability are discussed. The ways of controlling industrial and, in particular, nuclear risks in the UK are outlined. The basis of the radiation risk is explained along with the risk assessment approaches applied within the nuclear facility licensing process. The risks from various kinds of activity of man are compared and examples are given. The application of cost-benefit analysis to nuclear safety assessment is shown by way of example. (J.B). 9 tabs., 7 figs.

747 (STUK-YTO-TR–53) **Reliability analysis of software based safety functions.** Pulkkinen, U. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Electrical and Automation Engineering). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). May 1993. 65p. (In Finnish). Order Number DE95606516. Source: OSTI; NTIS; INIS.

The methods applicable in the reliability analysis of software based safety functions are described in the report. Although the safety functions also include other components, the main emphasis in the report is on the reliability analysis of software. The check list type qualitative reliability analysis methods, such as failure mode and effects analysis (FMEA), are described, as well as the software fault tree analysis. The safety analysis based on the Petri nets is discussed. The most essential concepts and models of quantitative software reliability analysis are described. The most common software metrics and their combined use with software reliability models are discussed. The application of software reliability models in PSA is evaluated; it is observed that the recent software reliability models do not produce the estimates needed in PSA directly. As a result from the study some recommendations and conclusions are drawn. The need of formal methods in the analysis and development of software based systems, the applicability of qualitative reliability engineering methods in connection to PSA and the need to make more precise the requirements for software based systems and their analyses in the regulatory guides should be mentioned. (orig.). (46 refs., 13 figs., 1 tab.).

2101 Power Reactors, Nonbreeding, Light-Water Moderated, Boiling Water Cooled

Refer also to citation(s) 191, 215, 766, 875, 876, 877, 878, 880, 1109, 1151

748 (CEA-CONF–11841) **On the prediction of flooding phenomenon with the Cathare code.** Freitas, R.; Bestion, D. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 13p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606519. Source: OSTI; NTIS (US Sales Only); INIS.

This paper presents a new method implemented into the CATHARE code to control the flooding limit in some areas of the reactor characterized by a complex geometry. The knowledge of

these limits require experimental information which is generally correlated using classical Wallis type or Kutateladze type flooding models. The way to implement such correlations in a 6-equation model with two phasic momentum equations is presented. It is based on the drift-flux model and the envelope theory. A singular interfacial friction model and a limit void fraction is derived. Calculations with this modelling are compared with the experimental data from HANNOVER tests. (authors). 4 figs., 11 refs.

749 (JAERI-Research–94-003) **Analysis of reactor power oscillation based on nonlinear dynamic theory.** Suzudo, Tomoaki (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 99p. (In Japanese). Order Number DE95709889. Source: OSTI; NTIS; INIS.

Reactor power oscillations are discussed based on nonlinear dynamic theory with reference to stability problem of boiling water reactors (BWRs). The reactor noise from an actual plant is, firstly, analyzed by a method originally used for the analysis of chaotic phenomenon. The results show that this method gives better dynamic descriptor of oscillatory motion than those from previous methods, and that it is applicable to real-time monitoring system of the reactor core. Next, the low-dimensional phenomenological model of BWR power oscillation is analytically studied using bifurcation theory, a branch of nonlinear dynamic theory. From this analysis are derived explicit expressions for the steady state's linear stability and weak stability not given by numerical analyses, and the qualitative properties of the power oscillation can be better understood. (author).

750 (NUREG–0750-Vol.40-No.2) **Nuclear Regulatory Commission issuances: August 1994: Volume 40, Number 2.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. Aug 1994. 95p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

This report contains the collected issuances of the US Nuclear Regulatory Commission for the month of August, 1994. The report includes issuances of the Commission, the Atomic Safety and Licensing Boards, and the Directors' Decisions. Some of the entities involved include Gulf States Utility company, Sequoyah Fuels Corporation and General Atomics, Georgia Power Company, and Arizona Public Service Company.

751 (STUK-B-YTO–120) **Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1993 and annual summary.** Tossavainen, K. (ed.). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Jun 1994. 26p. Order Number DE95606520. Source: OSTI; NTIS; INIS.

Published also in Finnish as report number STUK-B-YTO–115.

Quarterly reports on the operation of the Finnish NPPs describe nuclear and radiation safety related events and observations which the Finnish Centre for Radiation and Nuclear Safety considers significant. Safety improvements at the plants and general matters relating to the use of nuclear energy are also reported. A summary of the radiation safety of plant personnel and the environment, and tabulated data on the plants' production and load factors are also given. One event during the last quarter of 1993 was rated on the International Nuclear Event Scale (INES) as level 1. During this event at Loviisa 2, the secondary circuit emergency feedwater system was erroneously isolated from automatic start-up readiness. The error went unnoticed for 4.5 hours. During 1993 one level 2 incident and three level 1 incidents occurred at the Finnish NPPs. (8 figs., 4 tabs.).

752 (STUK-YTO-TR–36) **The protection and inspection of prestressing tendons in containment structures of nuclear power plants.** Vesikari, E. (Technical Research Centre of Finland, Espoo (Finland)). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Jan 1992. 52p. (In Finnish). Order Number DE95606521. Source: OSTI; NTIS; INIS.

The prestressing tendons of nuclear power plant containment structures are classified as vital structural members. For this reason the condition of tendons must be inspected periodically during the service life of the plant. Inservice inspection is demanded also for grouted tendons. Regulatory Guide 1.90, issued by the U.S. Regulatory Commission, normally serves as a basis for inservice inspection for grouted tendons but there are different forms of application in different countries. During the past years experiences have been gained of different practices and new inspection methods have been brought forth. Also, the protection methods of tendons have been developed. This report is a summary of the development at 1980's and a general account of the level of knowledge at present. (au). (37 refs., 5 figs., 7 tabs.).

753 (STUK-YTO-TR–45) **Experience based reliability centered maintenance: An application on motor operated valve drives.** Haenninen, S. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Electrical and Automation Engineering); Laakso, K. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Mar 1993. 61p. Order Number DE95606522. Source: OSTI; NTIS; INIS.

The systematic analysis and documentation of operating experiences should be included in a living NPP life management program. Failure mode and effects and maintenance effects analyses are suitable methods for analysis of the failure and corrective maintenance experiences of equipment. Combined use of the information on occurred functional failures and the decision tree logic of the reliability centered maintenance identifies applicable and effective preventive maintenance tasks of equipment in an old plant. In this study the electrical motor drives of closing and isolation valves (MOV) of TVO and Loviisa nuclear power plants were selected to serve as pilot study objects. The study was limited to valve drives having actuators manufactured by AUMA in Germany. The fault and maintenance history of MOVs from 1981 up to and including October 1991 in different safety and process systems at TVO 1 and 2 nuclear power units was at first analyzed in a systematic way. The scope of the components studied was 81 MOVs in safety-related systems and 127 other MOVs per each TVO unit. In the case of the Loviisa plant, the observation period was limited to three years, i.e. from February 1989 up to February 1992. The scope of the Loviisa 1 and 2 components studied was 44 respectively 95 MOVs. (25 refs., 22 figs., 8 tabs.).

754 (STUK-YTO-TR–58) **Ageing study of protection automation components of Olkiluoto nuclear power plant.** Simola, K. (Technical Research Centre of Finland, Espoo (Finland). Lab. of Electrical and Automation Engineering); Haenninen, S. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Jul 1993. 42p. (In Finnish). Order Number DE95606523. Source: OSTI; NTIS; INIS.

A study on ageing of reactor protection system of the Olkiluoto nuclear power plant is described. The objective of the study was to present an ageing analysis approach and apply in to the automation chains of reactor protection system of the Olkiluoto nuclear power plant. The study includes the measuring instrumentation, the protection logics, and the control electronics of some pumps and valves. The analysis is based on the information collected on the structure of the system, environmental conditions and maintenance practices of components, and operating experience. Based on this information, the possible ageing effects of equipment and their safety significance are evaluated. (orig.). (15 refs., 16 figs., 12 tabs.).

2102 Power Reactors, Nonbreeding, Light-Water Moderated, Nonboiling Water Cooled

Refer also to citation(s) 191, 198, 748, 750, 751, 752, 753, 875, 876, 877, 881, 1109, 1150, 1151, 1160, 1161, 1481

755 (CEA-CONF–11792) **Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants.** Lloret, R. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Reacteurs Experimentaux. 1993. 8p. (In French). (CONF-9303315–: Workshop on Pressure Vessel Surveillance Programmes and their Applications, Prague (Czech Republic), 16-18 Mar 1993). Order Number DE95606535. Source: OSTI; NTIS (US Sales Only); INIS.

In this text we give the dosimetry principle on irradiated materials such baffle screw, pressure vessel and control element cans. This measure, made by gammametry, is based on the steel activation

and comparison with calculated measures by Actige code. 4 figs., 6 refs.

756 (CEA-CONF–11799) **Neutron spectrum effect on PV-steels embrittlement: dosimetry and qualification of irradiation locations in Osiris and Siloe reactors.** Beretz, D. (CEA Centre d'Etudes de Grenoble, 38 (France). Direction des Reacteurs Nucleaires); Alberman, A.; Bourdet, L.; Carcreff, H. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Direction des Reacteurs Nucleaires. 1993. 8p. (CONF-930809–: 8. ASTM-EURATOM symposium on reactor dosimetry, Vail, CO (United States), 29 Aug - 3 sep 1993). Order Number DE95606539. Source: OSTI; NTIS (US Sales Only); INIS.

Two irradiation experiments have been undertaken in OSIRIS (Saclay) and SILOE (Grenoble) reactors, in order to establish correlation between pressure vessel steels embrittlement and neutron spectrum. Target fluence is 0.1 dpa for both experiments. This damage fluence corresponds to a fluence of 7.5 10^{19} $n.cm^{-2}$ (E > 1 MeV) in the case of a well moderated light water spectrum, but only 4 - 5 10^{19} $n.cm^{-2}$ in the case of the specially designed SILOE irradiation location. One irradiation run is now completed, the second one is underway. This paper presents the experimental dosimetry data and irradiation parameters obtained in the preliminary qualification program, needed to assess this damage correlation. (authors). 2 figs., 3 tabs., 6 refs.

757 (CEA-CONF–11830) **PWR accident management related tests: some Bethsy results.** Clement, P.; Chataing, T.; Deruaz, R. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 10p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606542. Source: OSTI; NTIS (US Sales Only); INIS.

The BETHSY integral test facility which is a scaled down model of a 3 loop FRAMATOME PWR and is currently operated at the Nuclear Center of Grenoble, forms an important part of the French strategy for PWR Accident Management. In this paper the features of both the facility and the experimental program are presented. Two accident transients: a total loss of feedwater and a 2" cold leg break in case of High Pressure Safety Injection System failure, involving either Event Oriented - or State Oriented-Emergency Operating Procedures (EO-EOP or SO-EOP) are described and the system response analyzed. CATHARE calculation results are also presented which illustrate the ability of this code to adequately predict the key phenomena of these transients. (authors). 13 figs., 11 refs., 2 tabs.

758 (CEA-CONF–11831) **Loss of residual heat removal during mid-loop operation: Bethsy experiments.** Dumont, D.; Lavialle, G.; Noel, B.; Deruaz, R. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 9p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606543. Source: OSTI; NTIS (US Sales Only); INIS.

Loss of Residual Heat Removal has occurred in several PWR's during mid-loop operation after plant shutdown, and is now recognized as an accident situation whose relevant physical phenomena require improved understanding. Several cases have been selected to be investigated in the frame of the BETHSY program with the main purpose of providing an experimental basis for the assessment of safety codes which have been so far especially involved with accident transients initiated during full power operation. The major results from four experiments are presented in this paper, which addresses two main kinds of physical problems: - mechanisms for and rate of primary mass inventory reduction in case of manways opened at various locations in the primary coolant system, - cooling of the plant, when the primary is only half-open through vent paths and one steam generator is available to remove decay heat in reflux condenser mode with the presence of non condensable gas. (authors). 12 figs., 1 tab., 7 refs.

759 (CEA-CONF–11832) **Reflux condenser mode with non-condensible gas: assessment of Cathare against Bethsy test 7.2C.** Noel, B.; Deruaz, R. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 7p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606544. Source: OSTI; NTIS (US Sales Only); INIS.

The condensation process in the Steam Generator (SG) U-tubes with the presence of non-condensable gas (nitrogen) has been investigated on the Bethsy integral test facility. Bethsy test 7.2c dealing with Reflux Condenser mode consists of a succession of steady states where the effects of the amount of nitrogen, core power and secondary pressure on the primary to secondary heat transfer have been analyzed. Examination of non-condensable gas distribution in the SG U-tubes leads to the identification of an active zone where condensation takes place and a passive zone with a high concentration of nitrogen where no heat transfer occurs. The experimental data serve as a basis for the safety code assessment. The first verification of these situations has been performed with the Cathare code whose results are presented and discussed in the following pages. (authors). 5 figs., 1 tab., 7 refs.

760 (CEA-CONF–11833) **The effect of grid assembly mixing vanes on critical heat flux values and azimuthal location in fuel assemblies.** Crecy, F. de. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 8p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606545. Source: OSTI; NTIS (US Sales Only); INIS.

Critical Heat Flux (CHF) is one of the limiting phenomena for a PWR. It has been widely studied for years, but many facts are still not satisfactorily understood. This paper deals with the effect of the grid assembly mixing vanes on both the value of the CHF and the azimuthal location of the Departure from Nucleate Boiling (DNB). A series of experimental studies was performed on electrically heated, 5 x 5 square pitched, vertical rod bundles. Two specific grid assembly designs were used: with and without mixing vanes. DNB was detected by 8 thermocouples welded internally in each rod at the same level in order to determine the azimuthal location. The coolant was Freon-12 flowing upwards to simulate high pressure water (as defined by Stevens). Single phase flow experiments were also conducted to measure the exit temperature field in order to obtain the mixing coefficients for subchannel analysis. The results show very clearly that the mixing vanes have a significant effect on both the DNB azimuthal location and the CHF value: - without mixing vanes, DNB occurs mainly on the most central rod and preferentially at the azimuthal location facing the adjacent rod. - with mixing vanes, DNB can occur on any of the 9 central rods and is distributed in an apparently random way around the rod. - the effect of the mixing vanes on CHF is dramatic and depends a great deal on the parameter range (pressure, local mass velocity and local quality). Generally speaking, CHF with mixing vanes is significantly higher than without mixing vanes, but this effect can be inverted in some cases. In order to understand this fact more clearly, it is necessary to perform detailed analysis of subchannel behavior. Indeed, the analyses show that the magnitude of this effect is closely related to the mixing coefficients used. These mixing coefficients, estimated from the single phase flow experiments, are subject to large uncertainties in two-phase flow. (author). 2 figs., 2 tabs., 6 refs.

761 (CEA-CONF–11837) **The top-down reflooding model in the Cathare code.** Bartak, J.; Bestion, D.; Haapalehto, T. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 9p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606547. Source: OSTI; NTIS (US Sales Only); INIS.

A top-down reflooding model was developed for the French best-estimate thermalhydraulic code CATHARE. The paper presents the current state of development of this model. Based on a literature survey and on compatibility considerations with respect to the existing CATHARE bottom reflooding package, a falling film top-down reflooding model was developed and implemented into CATHARE version 1.3E. Following a brief review of previous work, the paper describes the most important features of the model. The model was validated with the WINFRITH single tube top-down reflooding experiment and with the REWET - II simultaneous bottom and top-down reflooding experiment in rod bundle geometry. The results

demonstrate the ability of the new package to describe the falling film rewetting phenomena and the main parametric trends both in a simple analytical experimental setup and in a much more complex rod bundle reflooding experiment. (authors). 9 figs., 28 refs.

762 (DOE/ET/34013–15) **The evaluation and demonstration of methods for improved nuclear fuel utilization: Final report.** Smith, G.P. Jr.; Pirek, R.C.; Freeburn, H.R.; Schrire, D. ABB/Combustion Engineering, Inc., Windsor, CT (United States); Entergy Operations, Inc., Russellville, AR (United States). Aug 1994. 239p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-79ET34013. (CEND–432). Order Number DE95001486. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The objective of the US Department of Energy (US DOE) sponsored program was to develop the technology to improve nuclear fuel utilization in a pressurized water reactor (PWR). The improvement was achieved through more efficient fuel management and an increase in the burnup of discharged fuel. Efficient, low-leakage fuel management concepts were developed and evaluated early in the program. Extended burnup capability was demonstrated by the irradiation of two lead test assemblies (LTAs) at Arkansas Nuclear One Unit 2 (ANO-2) located near Russellville, Arkansas. ANO-2 is a 2,815 MWt PWR owned by Arkansas Power and Light Company (APL) and operated by Entergy Operations, Inc. ANO-2 was the first ABB Combustion Engineering (ABB CE) designed reactor to utilize a 16 x 16 fuel assembly design. This is the final report for the program and covers activities from program inception in 1979 through program completion in 1994. The fuel management evaluations were completed and published in 1983. Irradiation and reactor poolside examinations of lead test assemblies were completed in February, 1988. All hot cell examinations were completed by the end of 1993. Evaluations of various fuel management schemes showed that the characteristic power duty cycle for low-leakage fuel management does not have a deleterious effect on fuel performance. These evaluations also demonstrated that the extended burnup objective could be realized with either conventional or low-leakage fuel management schemes. The extended burnup demonstration of the lead test assemblies showed that the ANO-2 16 x 16 standard fuel design, as well as selected advanced fuel rod designs, can achieve peak fuel rod average burnups of ~ 60 GWd/MTU with satisfactory results. This conclusion was substantiated by fuel examinations performed at reactor poolside and a hot cell facility.

763 (IAEA/NENP/TC–93/2, pp. 132-141) **Report to: 3. steering committee meeting of the extrabudgetary programme on safety of WWER NPPs.** Godoy, A. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Safety). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document is about a report on seismic upgrading of Kozluduy NPP-units 1-4. It summarizes IAEA activities related with site studies and the phased approach adopted for upgrading.

764 (IVO-A–10/93) **Seismic design and analysis methods.** Varpasuo, P. Imatran Voima Oy, Vantaa (Finland). 1993. 85p. (In Finnish). Order Number DE95606554. Source: OSTI; NTIS; INIS.

Seismic load is in many areas of the world the most important loading situation from the point of view of structural strength. Taking this into account it is understandable, that there has been a strong allocation of resources in the seismic analysis during the past ten years. In this study there are three areas of the center of gravity: (1) Random vibrations; (2) Soil-structure interaction and (3) The methods for determining structural response. The solution of random vibration problems is clarified with the aid of applications in this study and from the point of view of mathematical treatment and mathematical formulations it is deemed sufficient to give the relevant sources. In the soil-structure interaction analysis the focus has been the significance of frequency dependent impedance functions. As a result it was obtained, that the description of the soil with the aid of frequency dependent impedance functions decreases the structural response and it is thus always the preferred method when compared to more conservative analysis types. From the methods to determine the C structural response the following four were tested: (1) The time history method; (2) The complex frequency-response method; (3) Response spectrum method and (4) The equivalent static force method. The time history appeared to be the most accurate method and the complex frequency-response method did have the widest area of application. (orig.). (14 refs., 35 figs.).

765 (JAERI-Data/Code–94-006) **Improvement of pressure drop calculation model in TRAC-PF1 code.** Akimoto, Hajime (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ohnuki, Akira; Murao, Yoshio; Abe, Yutaka. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 46p. (In Japanese). Order Number DE95709892. Source: OSTI; NTIS; INIS.

In the analysis of thermal-hydraulic behaviors inside the pressurized water reactors (PWRs), it is essential to predict the pressure drop accurately because the flow direction of fluid is determined by the pressure balance in the system. To improve the accuracy of the TRAC-PF1/MOD1 code for the pressure drop prediction, the partitioning method of wall friction force between gas and liquid phases was modified and the correlation for the total wall friction force was replaced to the Baroczy's correlation, and the finite-difference method of the momentum conservation equation was changed at the cell boundary accompanied by the abrupt flow area change. The modified code was assessed using pressure drop data from various single pipes, Marviken critical flow test data, and pressure drop data at the pressure-vessel side broken cold leg of the Cylindrical Core Test Facility. The assessment calculations confirmed that the modifications can resolve the problems of the TRAC-PF1/MOD1 code such as the difference in total wall friction force between the original correlation and the TRAC-PF1 code, and the numerical pressure drop at the cell boundary with abrupt flow area change. The assessment calculation also confirmed that the accuracy of the pressure drop prediction was highly improved by the modifications for the pressure drop calculation models in the TRAC-PF1/MOD1 code. (author).

766 (STUK-YTO-TR–59) **A synthesis of hydrogen behaviour in severe reactor accidents.** Okkonen, T. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Aug 1993. 101p. Order Number DE95606555. Source: OSTI; NTIS; INIS.

The report discusses hydrogen behaviour in severe reactor accidents. An attempt is made to investigate most of the hydrogen-related phenomena into a synthetic approach. Simplistic analytical methods are developed and applied to the Finnish nuclear power plants, yielding easily understandable and reproducible results. The core dryout, heatup and melting phases are first described, focusing on hydrogen production during core degradation and fuel-coolant interactions. Hydrogen production is quantified, and the most important determinants are identified. The potential pressure and temperature loads caused by hydrogen in the containment calculated, and the need for mitigative measures is assessed. Finally, the natural circulation and mixing of containment gases are touched upon in order to estimate the potential success of proposed hydrogen mitigation measures. (39 refs., 6 fig., 27 tabs.).

767 (STUK-YTO-TR–69) **Validation of the reactor dynamics code HEXTRAN.** Kyrki-Rajamaeki, R. (VTT Energy, Espoo (Finland)). Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). May 1994. 24p. Order Number DE95606556. Source: OSTI; NTIS; INIS.

HEXTRAN is a new three-dimensional, hexagonal reactor dynamics code developed in the Technical Research Centre of Finland (VTT) for VVER type reactors. This report describes the validation work of HEXTRAN. The work has been made with the financing of the Finnish Centre for Radiation and Nuclear Safety (STUK). HEXTRAN is particularly intended for calculation of such accidents, in which radially asymmetric phenomena are included

and both good neutron dynamics and two-phase thermal hydraulics are important. HEXTRAN is based on already validated codes. The models of these codes have been shown to function correctly also within the HEXTRAN code. The main new model of HEXTRAN, the spatial neutron kinetics model has been successfully validated against LR-0 test reactor and Loviisa plant measurements. Connected with SMABRE, HEXTRAN can be reliably used for calculation of transients including effects of the whole cooling system of VVERs. Further validation plans are also introduced in the report. (orig.). (23 refs., 16 figs., 2 tabs.).

2103 Power Reactors, Nonbreeding, Graphite Moderated

Refer also to citation(s) 563, 826

768 (AREAEE–307) **Inventory calculation for an irradiated HTGR fuel element.** Elmasry, M.A.A. Nuclear Research Centre, Inshas (Egypt). 1989. 30p. Order Number DE95606594. Source: OSTI; NTIS (US Sales Only); INIS.

In this report the inventories of some gamma-active fission products were calculated for an irradiated capsule. The number of heavy metal atoms (fissile and fertile), as well as the number of atoms for fission products are calculated and given after each irradiation cycle. The energy produced at each irradiation period is calculated and given in watts. The burnup due to each element that underwent fission and the total burnup was also calculated. 1 fig., 19 tab.

769 (CEA-CONF–11785) **Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France.** Eid, M. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie); Nimal, J.C.; Carudel, G.; Gerat, L.M. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie. 1994. 6p. (CONF-940424–: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE95606595. Source: OSTI; NTIS (US Sales Only); INIS.

This is a revision of the past seven years experience in activation calculations for dismantling. It aims at evaluating the experience and at making better understanding to help in decision making during the following phases. Five gas cooled reactors are shutdown and are waiting for the EDF (Electricite De France) dismantling decision. The sixth (BUGEY1) will be shutdown by 1994 and will be waiting a dismantling decision as well. (authors). 3 figs., 3 tabs.

770 (GA-A–21720) **Helium turbomachine design for GT-MHR power plant.** McDonald, C.F. (General Atomics, San Diego, CA (United States)); Orlando, R.J.; Cotzas, G.M. General Atomics, San Diego, CA (United States). Jul 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89SF17885. (CONF-941007–1: Joint power generation conference, Phoenix, AZ (United States), 2-6 Oct 1994). Order Number DE95000722. Source: OSTI; NTIS; INIS; GPO Dep.

The power conversion system in the gas turbine modular helium reactor (GT-MHR) power plant is based on a highly recuperated closed Brayton cycle. The major component in the direct cycle system is a helium closed-cycle gas turbine rated at 286 MW(e). The rotating group consists of an intercooled helium turbocompressor coupled to a synchronous generator. The vertical rotating assembly is installed in a steel vessel, together with the other major components (i.e., recuperator, precooler, intercooler, and connecting ducts and support structures). The rotor is supported on an active magnetic bearing system. The turbine operates directly on the reactor helium coolant, and with a temperature of 850°C (1562°F) the plant efficiency is over 47%. This paper addresses the design and development planning of the helium turbomachine, and emphasizes that with the utilization of proven technology, this second generation nuclear power plant could be in service in the first decade of the 21st century.

771 (IAEA-TECDOC–757, pp. 29-41) **Safety criteria and provisions for the evacuation of residual heat from graphite gas cooled reactors.** Lheureux, R. (SPT, Division Calculus Nucleaires, Paris - La Defense (France)); Aguilera, A. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

The power given off by GGCR reactors is evacuated by CO_2 that is displaced by four turbo-blowers driven by steam from the steam generator. In order to evacuate the residual power after a unit shutdown, the turbo-blowers are driven by steam from the auxiliary boilers (at SAINT-LAURENT A and BUGEY 1), or by electric motors placed at the shaft end as is done at CHINON A3. In the event of these cooling systems failing whilst the reactor remains pressurized, there are emergency systems. At SAINT-LAURENT A shutdown exchangers are placed in a high position thus creating natural convection. At CHINON A3 the steam generators are above the core which also creates natural convection. At BUGEY 1 a motordriven blower ensures that CO_2 circulates; the steam generator is kept in operation. At SAINT-LAURENT A and BUGEY 1 when the reactors are under slight air pressure four fans evacuate the residual power in an open circuit. At CHINON A3 the reactor is kept in a closed circuit and the turbo-blowers are driven by their electric motors. The steam generator remains supplied. These systems have proved efficient as after twenty years of operation there has only been one incident at CHINON A3, three days before definitive shutdown. This necessitated going over to natural convection which was done according to procedures without the slightest problem. (author). 14 refs, 10 figs.

772 (IAEA-TECDOC–757, pp. 41-46) **Bases for the MHTGR source term and containment concepts.** Williams, P.M. (USDOE, Washington, DC (United States)). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Significant differences in transient response and materials of construction give high temperature gas-cooled reactor (HTGRs), the potential for alternate approaches to the key issues of selection and analysis of postulated accidents, the radionuclide source-term mechanisms, containment design, and emergency planning. For the MHTGR, the siting goal is to use the U.S. Environmental Protection Agency's protection action guidelines (PAGs) for notification, sheltering, and evacuation, rather than the NRC's doses of 300 rem to the thyroid and a 25 rem whole body. This paper discusses how the design and inherent characteristic of the MHTGR lead to a radionuclide source term of prompt and delayed components. Options for the MHTGR containment design are discussed for this source term and give support to the concept of a vented, low pressure containment in comparison to the high pressure, low leakage containments characteristic of LWRs. The source term concept has been proposed to the NRC and is currently under review. (author). 4 refs, 7 figs, 1 tab.

773 (IAEA-TECDOC–757, pp. 47-50) **The ultimate safety of the HTR-Module during hypothetical accidents.** Lohnert, G.H. (Siemens AG Unternehmensbereich KWU, Bergisch Gladbach (Germany). Bereich Energieerzeugung, Nukleare Entsorgung und Entwicklungsprojekte). International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

The HTR-Module is a power reactor with specially favourable safety features. This is evident by the fulfillment of the following claims: The maximum possible environmental damage is limited

and can be quantified; the consequences of all credible but extremely hypothetical accidents are restricted to the plant site and have no relevant offsite effect; the maximum offsite radiation doses are below the values prescribed for basic design accidents by article 28.3 of the German Radiation Protection Ordinance; in consequence there is no need to provide strategies for public sheltering or even evacuation and no need to prohibit the consumption of agricultural products. By the fulfillment of these claims the HTR-Module can be regarded as not to be burdened with a residual risk. (author). 5 refs, 1 fig.

774 (IAEA-TECDOC–757, pp. 53-62) **Distribution of the decay heat in various modul HTRs and influence on peak fuel temperatures.** Teuchert, E. (Forschungszentrum Juelich GmbH (Germany)); Haas, K.A.; Heek, A. van; Kasten, P.R. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

A unique feature of modular high-temperature reactors (MODUL-HTRs) is their benign response to a Loss-Of-Coolant Accident (LOCA). The reactor inherently becomes subcritical; the decay power partly heats up the reactor and partly is removed to the environment via thermal conduction and radiation, while avoiding overheating of the fuel. Production, storage, and removal of the decay heat is studied for different MODUL-HTR concepts having annular-core designs and thermal-powers of 350 MW_t. Based on use of Low-Enriched-Uranium/Thorium (LEU/Th) fuel cycles in Prismatic-Fueled Reactors (PFRs), and LEU fuel cycles in Pebble-Bed-Reactors (PBRs), the following has been determined: (1) Comparison of a PFR and a PBR having essentially the same design shows higher decay heat production in the PFR due to a higher fission-product inventory and to the decay of ^{233}Pa bred from ^{232}Th; comparison also shows lower heat-transport rates from the pebble-bed core during a LOCA due to the lower thermal conductivity of the core. (2) Changing the PBR design to utilize carbon bricks and an additional coolant gap in the outer regions of the reactor adds significant barriers to the transport of decay heat to the Reactor Cavity Cooling System (RCCS) which is external to the reactor vessel. (3) In HTRs for Gas-Turbine (GT) applications, the operating temperature of the reactor is higher than in Steam turbine Cycle (SC) HTRs; consequently, under LOCAs the relative heat transport to the RCCS is higher in GT-HTRs. As a result, during a LOCA the amount of heat energy stored in the GT-HTR cores was only about 50% of the amount stored in SC-HTR cores. (author). 8 refs, 9 figs, 5 tabs.

775 (IAEA-TECDOC–757, pp. 63-72) **Afterheat removal for HTR-10 test module under accident conditions.** Gao Zuying (Qinghua Univ., Beijing, BJ (China). Inst. of Nuclear Energy Technology); He Shuyan; Zhang Min. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

The reliable afterheat removal is a very important aspect for the reactor safety. In the preliminary design of HTR-10TM, a reactor cavity cooling system (RCCS) is arranged in the concrete reactor cavity with completely passive heat transfer. Two types of RCCS i.e. water RCCS and air RCCS are considered. The simple and reliable passive RCCS improves the safety and economy of the HTR-10TM. In this paper, a brief description of the RCCS design in HTR-10TM is presented. The heat removal characteristics of both water RCCS and air RCCS under the heatup test and accidents are described. They are analyzed by the THERMIX code. (author). 2 refs, 22 figs, 3 tabs.

776 (IAEA-TECDOC–757, pp. 72-75) **Flow schemes and design features of HTGR residual heat removal systems.** Golovko, V.F. (OKBM, Nizhny Novgorod (Russian Federation)); Kiryuschin, A.I.; Kuzavkov, N.G. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

HTGRs are intended to be located near industrial plants and residential areas, therefore they must possess enhanced safety characteristics. One of the most important safety aspects associated with reactor operation is reliability of residual heat removal system (RHRS). This paper describes design options for heat removal systems for small pebble bed reactor which provide a high degree of reliability for residual heat removal. (author). 1 fig., 1 tab.

777 (IAEA-TECDOC–757, pp. 75-82) **Passive decay and residual heat removal in the MHTGR.** Dilling, D.A. (Bechtel National, Inc., San Francisco, CA (United States)); Ghose, S.K.; Berkoe, J.M.; Caspersson, S.A.; Bramblett, G.C. International Atomic Energy Agency, Vienna (Austria). Aug 1994. Contract DE-AC03-89SF1788. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

The modular high temperature gas-cooled reactor (MHTGR) being developed in the United States has the capability to reject decay and residual heat passively by conduction, natural convection, and radiation from the reactor core to the ultimate heat sink - the atmosphere - when normal heat rejection systems are unavailable. The method proposed for the U.S. MHTGR is referred to as the Reactor Cavity Cooling System (RCCS) and makes use of an uninsulated reactor vessel located in an enclosed cavity. The cavity walls are lined with cooling panels that allow outside air to flow in and out in an open once-through natural circulation loop. In this arrangement, the heat removal takes place first by transferring heat from the reactor core to the vessel by conduction, radiation and natural convection. Second, heat is transferred from the uninsulated vessel to the cooling panels primarily by radiation from the hot vessel surface to the relatively cold panel surface, and partly by natural convection of the enclosed cavity air. Third, heat is transported and rejected to the atmosphere by buoyancy-driven natural circulation of outside air through the cooling panels. The system functions at all times and does not rely on any active component or operator action. The operator cannot start, operate, or terminate the heat removal process. 5 refs, 10 figs, 3 tabs.

778 (IAEA-TECDOC–757, pp. 83-89) **Impact of increasing MHTGR power on passive heat removal.** Dunn, T.D. (General Atomics, San Diego, CA (United States)); Schwartz, A.A.; Silady, F.A. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

In 1990 a cost reduction study recommended that the reference U.S. MHTGR module design be changed to an 84-column, 450 MW(t) annular reactor core to attain improved economics with the same high level of safety as the previous reference 66-column, 360 MW(t) MHTGR module. The objective of this paper is to report on a recently completed core configuration trade study that reviewed the basis for that recommendation with more detailed assessments. The trade study examined alternate core configurations in terms of the size, shape, and power level. Core configurations at 450 MW(t), an alternative at higher power, and one at lower power

were considered. These alternatives represented the maximum achievable power for fuel element for two different reactor vessel sizes. Fuel, reactor internal and vessel temperatures during pressurized and depressurized conduction cooldown transients are presented and compared to limits. Based on the need to improve economics without sacrificing the MHTGR's high level of safety, the trade study confirmed that the previously selected 84-column, 450 MW(t) annular design remains the preferable configuration. (author). 1 ref., 4 figs, 4 tabs.

779 (IAEA-TECDOC–757, pp. 95-103) **Analytical and experimental investigations of the passive heat transport in HTRs under severe accident conditions.** Rehm, W. (Forschungszentrum Juelich GmbH (Germany)); Barthels, H.; Jahn, W.; Cleveland, J.; Ishihara, M. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Thermodynamic accident analyses have been performed with computer simulation models to investigate core heatup sequences, sensitivity analyses, power variations, anticipated transients without scram, and core displacement considerations for probabilistic safety analyses (PSA) of small gas-cooled high-temperature reactors (e.g. HTR-Module). In worst case considerations where not only a loss of the active heat removal system is assumed but also a loss of the vessel cooling system, the heat would be transported into the surrounding concrete structure. In such a case the concrete would act as a natural long-term intermediate heat storage dissipating the heat through the concrete surface. Large scale and reactor safety experiments have been performed to investigate passive heat transport mechanisms - which can cooldown a HTR core during severe accident conditions - for validation basis of computer simulation codes used for accident analyses. In general, the comparisons of experimental and analytical results with computer calculations of the heat transport codes are in good agreement. (author). 15 refs, 16 figs, 3 tabs.

780 (IAEA-TECDOC–757, pp. 104-110) **Presentation of decay heat removal computer codes used for gas cooled reactors.** Carvallo, G. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie); Dobremelle, M.; Mejane, A. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

For the existing French Magnox type reactors, two computer codes have been developed to analyze the transient after reactor shutdown: The first one, "GITA", is representative of the short term evolution (less than 2 days) and it includes a refined representation of all the reactor components; the second one, "LOTE", has been developed to represent the long term evolution (from 2 days to several months) with a simplified representation of the main components of the reactor. One example of accident simulation is presented for existing Magnox reactor. Moreover, as a part of the French program on the future reactors, an analysis of the modular high temperature has been initiated. 2D and 3D general flow and conduction codes are used for this analysis: DELFINE is a 2D conduction code including a 1D thermosyphon model. It has been used for decay heat removal analysis. TRIO is a 3D flow code including 3D radiation, conduction and convection heat transfer. It is used for detailed thermal analysis during accidental conditions. (author). 9 refs, 6 figs, 1 tab.

781 (IAEA-TECDOC–757, pp. 111-116) **Modeling and analysis of heat transfer from the MHTGR core through a steel reactor vessel to the reactor cavity cooling system.** Dilling, D.A. (Bechtel National, Inc., San Franciso, CA (United States)); Berkoe, J.M.; Ghose, S.K.; Dunn, T.D.; Caspersson, S.A. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

The commercial Modular High Temperature Gas-Cooled Reactor (MHTGR) achieves improved reactor safety performance and reliability by utilizing an integrated sequence of completely passive thermal storage and heat transfer mechanisms to reject decay heat in the event that all its active cooling systems fail to operate. During such events, the initial heatup transient in the core is followed by a quasi-steady state cooldown process which, if uninterrupted, can continue for several days. A buoyancy-driven natural convection cooling system called the RCCS facilitates the continuous heat removal by circulating ambient air through the reactor cavity, where it is heated and then exhausted to the outside environment. The peak thermal load on the RCCS occurs approximately at the time that the vessel reaches its highest temperature. To confirm the adequacy of the RCCS design, detailed analytical models were developed to simulate the decay heat removal process and predict the maximum vessel temperature at this condition. Due to the integrated nature of the MHTGR thermal characteristics and the complexity of the RCCS configuration in the reactor cavity, a three-dimensional computer model of the 350 MWt plant design which extends from the reactor core to the outside environment was created to simulate the entire decay heat removal process. The results of the analyses confirm that the MHTGR core temperatures remain below their prescribed design limits, and that the RCCS adequately maintains peak vessel temperatures within acceptable limits. In providing increased understanding of the passive heat transfer mechanisms which prevail during MHTGR accident conditions, the analysis results show that the combined effects of thermal radiation, free convection, and non uniform RCCS geometry can play significant roles in the decay heat removal process and strongly influence the reactor vessel temperature profile. (author). 2 refs, 11 figs.

782 (IAEA-TECDOC–757, pp. 117-122) **Analysis of after-heat removal from modular HTGRs during accidents, and a concept for use of spherical fuel elements in LWRs.** Mosevitskij, I.S. (Gosudarstvennyj Komitet po Ispol'zovaniyu Atomnoj Ehnergii SSSR, Moscow (Russian Federation). Inst. Atomnoj Ehnergii); Goltsev, A.O.; Mikhailov, P.V.; Tsibulskij, V.F.; Davidenko, V.D.; Popov, V.S.; Udyanskij, Yu.N. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Calculation codes DIAB and KORSAR have been developed and calculations of accidents with ceasing of the circulations and loss of coolant for the modular reactor have been carried out. Some coefficients of sensitivity to the model parameters have been determined. It is shown that account for the fuel element circulation reduces noticeably the maximum fuel temperature in these accidents. Possible use of the fuel elements, similar to the HTGR spherical fuel elements, in the LWRs is considered. It is expected that these new-type reactors would be able to withstand LOCAs, with the fuel elements and protection barriers remaining intact. (author). 1 ref., 7 figs, 1 tab.

783 (IAEA-TECDOC–757, pp. 125-130) **Heat transfer in the upper part of the HTTR pressure vessel during loss of forced cooling.** Shiina, Y. (Japan Atomic Energy Research Inst., Ibaraki (Japan)); Hishida, M. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists*

meeting held in Juelich, Germany, 6-8 July 1992. 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Heat transfer characteristics in upper part of pressure vessel of High Temperature Engineering Test Reactor (HTTR) during loss of forced cooling were studied experimentally by the use of hemispheres heated from below. Natural convection heat transfer and flow characteristics without thermal radiation were studied with several kinks of liquids as working fluids and thermo-sensitive liquid crystal powders as a visualization tracer. The ranges of Rayleigh and Prandtl numbers for the study were $10^6 < Ra < 5.5 \times 10^{10}$ and $6 < Pr < 13000$ for heat transfer experiment and $2 \times 10^5 < Ra < 1.9 \times 10^9$ and $6 < Pr < 13000$ for flow visualization experiment. Heat transfer correlations and flow characteristics were clarified in laminar and turbulent regions. In laminar region, circulating flow existed in a hemisphere, i.e., hot fluid risen up near the center of the hemisphere arrived at the top of the hemisphere and flowed downward along inner surface of hemisphere. Whereas, in turbulent region of $Ra > 10^9$, the circulating flow disappeared and random upward and downward flow became dominant. Hot fluid released from the hot surface is dissipated immediately in surrounding fluid. Natural convection heat transfer experiment with thermal radiation is now also being carried. Maximum temperature of a hot surface can be raised up to 600 deg. C. Air is used as a working fluid. Rayleigh number range will be $1.5 \times 10^8 < Ra < 5.3 \times 10^8$. Net heat transfer rate by natural convection can be obtained by subtracting the calculated heat transfer rate by thermal radiation. Estimated heat transfer rate by natural convection is compared with the results of natural convection experiment without thermal radiation. (author). 15 refs, 11 figs.

784 (IAEA-TECDOC–757, pp. 131-139) **Development of an inactive heat removal system for high temperature reactors.** Kugeler, K. (Rheinisch-Westfaelische Technische Hoschschule, Aachen (Germany)); Sappok, M.; Beine, B.; Wolf, L. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Growing public and political interests towards incorporating passive safety features in nuclear installations, let Siempelkamp in late 1987 propose a solution consisting of a prestressed cast-iron pressure vessel and a passive heat removal system, integrated in the reactor cell surrounding the vessel. This solution combines the inherent safety of a prestressed metallic pressure vessel with the advantages of a passive heat removal system and thus constitutes a major step towards the goal of further reducing potential residual risks. The design had to meet the boundary conditions for reactor core and reactor building of the modular 200 MWth pebble bed reactor of Siemens/-KWU. The engineering design showed that many input parameters needed for the finite-element-analysis of the overall structure required a verification by measurements in a well scaled test setup. This was especially required for the heat transfer from the liner of the prestressed cast-iron pressure vessel to the natural convection cooling system in the cell and forward to the outer surface of the cell. The data of six experiments provided a sound basis for demonstrating the feasibility of the proposed design and for deducing important thermal input parameters for code predictions. Furthermore, it could be demonstrated that the heat can be transported from the core via the natural convection system to the outside for all normal and emergency conditions up to the depressurization accident without exceeding the allowable temperatures for the various structural components. This holds also for a failure of the embedded cooling system. For comparison, a reference test with a steel pressure vessel wall proved that the differences in maximum temperatures between steel wall and prestressed cast iron pressure vessel wall were smaller than anticipated. A comparison paper provides details of experimental and analytical results. (author). 3 refs, 9 figs.

785 (IAEA-TECDOC–757, pp. 139-146) **Passive heat removal experiments for an advanced HTR-module reactor pressure vessel and cavity design.** Wolf, L. (Battelle-Institut e.V., Frankfurt am Main (Germany)); Kneer, A.; Schulz, R.; Giannikos, A.; Haefner, W. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

In the search for further reducing the residual risks of possible major reactor pressure vessel failure during and in the aftermath of severe accident of modular HTR's, an alternative RPV has been designed and a sample vessel already fabricated by the firm Siempelkamp, Krefeld, FRG. This alternative RPV design is made of high quality, ductile sphero cast iron with axial and circumferential wire prestressing or more recently also with circumferentially flat band prestressing. This specific Siempelkamp design has been tested and qualified in a series of experiments with the sample test vessel. This design was also used for the control gas vessel in the THTR under operational service conditions. In order to demonstrate reliable decay heat removal under most severe conditions, and 1:1 scale, 20 deg. sector of the vessel/cavity, termed INWA-facility (Inactive decay heat removal) was fabricated and tested at Siempelkamp. The cavity was cooled by natural circulation of water flowing in tubes embedded in the cast iron structure of the cavity. A total of 5 experiments were performed with this setup examining a variety of changes in constructive details, surface and cooling conditions. Each experiments was performed both for operational conditions and depressurization transients, typical for a 200 MW_{th} HTR-module. Experimental test durations ranged up to 1000 hours. Pre- and post-test predictions with the FEM-code TOPAZ accompanied the INWA test series. THis paper describes the INWA-facility and the experimental results as well as the predictive capability of the TOPAZ-code by comparing the data with computational results. The INWA-results qualify the pre-stressed cast iron vessel together with the natural circulation cooled cavity even for the worst of severe accident conditions. Even in the case of a total failure of all cooling capabilities in or at the cavity structure the vessel surface temperature remains below critical values. (author). 5 refs, 18 figs, 1 tab.

786 (IAEA-TECDOC–757, pp. 147-151) **Test apparatus of cooling panel system for MHTGR.** Takada, S. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Dept. of High Temperature Engineering); Suzuki, K.; Inagaki, Y.; Miyamoto, Y. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

A test apparatus of cooling panel system is provided to investigate heat removal performance and temperature distribution of reactor pressure vessel. The test apparatus consists of a test section and systems for water supply, helium gas supply, vacuum and instrumentation and control. The test section is composed of pressure vessel (1000mm in diameter, 3000mm in height) containing an electric heater (max. 100kw, 600 deg. C) which simulates a reactor core and cooling panels surrounding the pressure vessel. Helium and argon gas are used and gas pressure is varied from vacuum to 1.0MPa in the pressure vessel. In the test, temperature distribution of the components in the test section, helium gas temperature, heat flux removed from the electric heater and heat flux transferred to the cooling panels are acquired. (author). 3 refs, 4 figs.

787 (IAEA-TECDOC–757, pp. 151-160) **SANA experiments related to self-operating removal of decay heat.** Niessen, H.F. (Forschungszentrum Juelich GmbH (Germany). Inst. fuer Sicherheitsforschung und Reaktortechnik); Lange, M.G. International Atomic Energy Agency, Vienna (Austria). Aug 1994. (CONF-9207180–: Meeting on Decay Heat Removal and Heat

Transfer under Normal and Accident Conditions in Gas-Cooled Reactors, Juelich (Germany), 6-9 Jul 1992). In *Decay heat removal and heat transfer under normal and accident conditions in gas cooled reactors: Proceedings of a specialists meeting held in Juelich, Germany, 6-8 July 1992.* 162p. Order Number DE95606514. Source: OSTI; NTIS (US Sales Only); INIS.

Simulating the loss of coolant accident in an experiment, the reactor conditions have to be matched as close as possible. To establish the principle of self-operating heat transport for the decay heat removal, a demonstrating experiment (SANA II) is in preparation. To prepare such an experimental set up, which distinctly exceeds the laboratory scale, a preliminary test facility SANA 1 has been built up. For SANA-II a horizontal section of a reactor in full scale will be setup, including a sector of the core, the reflector, the vessel and the primary cell, where the decay heat production is simulated within the core. (author). 3 refs, 13 figs.

788 (LA-SUB–94-143) **High-level assessment of LANL ABC Design.** Los Alamos National Lab., NM (United States); Barthold Associates, Inc., Knoxville, TN (United States). 15 Apr 1994. 151p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001392. Source: OSTI; NTIS; GPO Dep.

An annual weapon's grade Pu disposition goal should be stated and related to the amount of Pu that needs to be disposed of. It needs to be determined to what extent it is possible to destroy Pu without building up any new Pu, i.e., how realistic this goal is. The strong positive Doppler coefficient for a Pu core might require the addition of some fertile material to ensure a negative Doppler coefficient. This in turn will affect the net Pu disposition rate. If a fertile material is required throughout the life of the ABC to ensure a negative Doppler coefficient, the difference between the molten salt ABC and other reactors in regard to Pu disposition is not a principled difference anymore but one of degree. A rationale has then to be developed that explains why "x" kg production of fissile material are acceptable but "y" kg are not. It is important to determine how a requirement for electricity production will impact on the ABC design choices. It is conceivable that DOE will not insist on electricity generation. In this case advantage has to be taken in terms of design simplifications and relaxed operating conditions.

2104 Power Reactors, Nonbreeding, Otherwise Moderated Or Unmoderated

Refer also to citation(s) 152, 822, 825, 841, 843, 858, 863, 872

2105 Power Reactors, Breeding

Refer also to citation(s) 870, 1152

789 (CEA-CONF–11783) **Fluid structure interaction in L.M.F.B.R. cores. Flowering response to an impulse load.** Brochard, D. (Institut National des Sciences et Techniques Nucleaires (INSTN), Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)); Queval, J.C.; Gantenbein, F.; Gibert, R.J. Institut National des Sciences et Techniques Nucleaires (INSTN), Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). 1994. 10p. (CONF-940613–: 1994 pressure vessels and piping conference, Minneapolis, MN (United States), 19-23 Jun 1994). Order Number DE95606614. Source: OSTI; NTIS (US Sales Only); INIS.

Some incidental situations like MFCI (melting fuel coolant interaction) may induce a core flowering and lead to consider impulse loads applied to LMFBR cores. These highly dynamic loads are very different, considering their spatial repartition and their frequency content, from the seismic loads which have been deeply studied. Recently, tests have been performed on the LMFBR core mock-up RAPSODIE which consist in injecting water quickly in the mock-up through a specific device replacing the central assembly. The experimental results have been used to validate the numerical models. This paper presents first the experimental device and the tests results. Then a non linear model taking into account the impacts between the subassemblies is described; it is based on an homogenization method allowing to represent with accuracy the fluid structure interaction in the core. The comparison between the calculation results and the experimental results will be finally presented. (authors). 7 figs., 9 refs.

790 (CEA-CONF–11835) **One component, volume heated, boiling pool thermohydraulics.** Bede, M.; Perret, C.; Pretrel, H.; Seiler, J.M. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 10p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606615. Source: OSTI; NTIS (US Sales Only); INIS.

Prior work on boiling pools provided heat exchange correlations valid for bubbly flow with laminar or turbulent boundary layers. New experiments performed with water (SEBULON) and UO_2 (SCARABEE BF2) in a churn-turbulent flow configuration show unexpected heat flux distributions for which the maximum heat flux may be situated well below the pool surface. The origin of this behaviour is attributed to condensation effects, very unstable boundary layer flow and surface oscillation. A calculation model is discussed which permits to approach the experimental heat flux distribution with reasonable accuracy. (authors). 7 figs., 2 appendix., 14 refs.

2106 Power Reactors, Mobile, Propulsion, Package, and Transportable

Refer also to citation(s) 819, 938

791 (LA-UR–94-2701) **Characteristics of prototype TOPAZ-II fuel.** Hoth, C.W, (Los Alamos National Lab., NM (United States)); Blair, H.T; Degaltsev, Y.; Rakitskaya, E.; Gontar, A.; Nicolaev, Y.; Vybyvanets, V. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950110–2: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE94018087. Source: OSTI; NTIS; GPO Dep.

Selective Sampling was conducted on three fuel pellet stacks that were manufactured by the reference process for the TOPAZ-II reactor. The sampling and inspection of approximately two hundred feel pellets were jointly conducted by US and Russian specialists. The Spring activity was conducted to evaluate the fuel characterization and sampling methods, and to examine the as-fabricated characteristics of the fuel. The inspection procedure allowed studies of pellets from various batches of initial powder and from various sintering batches. The following characteristics were evaluated: pellet dimensions, O/U, isotopic composition, impurity content, and macro-and micro-structure.

792 (SAND–94-2033C) **Real-time dynamic simulator for the Topaz II reactor power system.** Kwok, K.S. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410181–3: 15. aerospace testing seminar, Manhattan Beach, CA (United States), 11-13 Oct 1994). Order Number DE95001604. Source: OSTI; NTIS; INIS; GPO Dep.

A dynamic simulator of the TOPAZ II reactor system has been developed for the Nuclear Electric Propulsion Space Test Program. The simulator is a self-contained IBM-PC compatible based system that executes at a speed faster than real-time. The simulator combines first-principle modeling and empirical correlations in its algorithm to attain the modeling accuracy and computational through-put that are required for real-time execution. The overall execution time of the simulator for each time step is 15 ms when no data is written to the disk, and 18 ms when nine double precision data points are written to the disk once in every time step. The simulation program has been tested and it is able to handle a step decrease of $8 worth of reactivity. It also provides simulation of fuel, emitter, collector, stainless steel, and ZrH moderator failures. Presented in this paper are the models used in the calculations, a sample simulation session, and a discussion of the performance and limitations of the simulator. The simulator has been found to provide realistic real-time dynamic response of the TOPAZ II reactor system under both normal and causality conditions.

793 (SAND–94-2376C) **Issues in the flight qualification of a space power reactor.** Polansky, G.F. (Phillips Lab., Albuquerque, NM (United States)); Schmidt, G.L.; Voss, S.S.; Reynolds, E.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410181–2: 15. aerospace testing seminar, Manhattan Beach, CA (United States), 11-13 Oct 1994). Order Number DE95001606. Source: OSTI; NTIS; GPO Dep.

This paper presents an overview of the Nuclear Electric Propulsion Space Test Program (NEPSTP). The program goals, the proposed mission, the spacecraft, and the Topaz II space nuclear power system are described. The subject of flight qualification is examined and the inherent difficulties of qualifying a space reactor are described. The differences between US and Russian flight qualification procedures are explored. A plan is then described that was developed to determine an appropriate flight qualification program for the Topaz II reactor to support a possible NEPSTP launch. Refocusing of the activities of the Ballistic Missile Defense Organization (BMDO), combined with budgetary pressures, forced the cancellation of the NEPSTP at the end of the 1993 fiscal year.

2107 Regulation and Licensing

Refer also to citation(s) 750

794 (NUREG–0750-Vol.39-Index-2) **Indexes to Nuclear Regulatory Commission Issuances, January–June 1994.** Nuclear Regulatory Commission, Washington, DC (United States). Div. of Freedom of Information and Publications Services. [1994]. 72p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

Digests and indexes for issuances of the Commission (CLI), the Atomic Safety and Licensing Board Panel (LBP), the Administrative Law Judges (ALJ), the Director's Decisions (DD), and the Denials of Petitions for Rulemaking (DPRM) are presented in this document. These digests and indexes are intended to serve as a guide to the issuances.

2108 Economics

Refer also to citation(s) 205, 953

795 (AREAEE–283) **Nuclear fuel cycles : description, demand and supply estimates.** Gadallah, A.A.; Abou Zahra, A.A.; Hammad, F.H. Nuclear Research Centre, Inshas (Egypt). 1985. 75p. Order Number DE95606833. Source: OSTI; NTIS (US Sales Only); INIS.

This report deals with various nuclear fuel cycles description as well as the world demand and supply estimates of materials and services. Estimates of world nuclear fuel cycle requirements: nuclear fuel, heavy water and other fuel cycle services as well as the availability and production capabilities of these requirements, are discussed for several reactor fuel cycle strategies, different operating and under construction fuel cycle facilities in some industrialized and developed countries are surveyed. Various uncertainties and bottlenecks which are recently facing the development of some fuel cycle components are also discussed, as well as various proposals concerning fuel cycle back-end concepts. finally, the nuclear fuel cycles activities in some developing countries are reviewed with emphasis on the egyptian plans to introduce nuclear power in the country. 11 fig., 16 tab.

796 (IAEA-TECDOC–753) **Net energy analysis of different electricity generation systems.** International Atomic Energy Agency, Vienna (Austria). Jul 1994. 107p. Order Number DE95604081. Source: OSTI; NTIS (US Sales Only); INIS.

This document is a report on the net energy analysis of nuclear power and other electricity generation systems. The main objectives of this document are: To provide a comprehensive review of the state of knowledge on net energy analysis of nuclear and other energy systems for electricity generation; to address traditional questions such as whether nuclear power is a net energy producer or not. In addition, the work in progress on a renewed application of the net energy analysis method to environmental issues is also discussed. It is expected that this work could contribute to the overall comparative assessment of different energy systems which is an ongoing activity at the IAEA. 167 refs, 9 figs, 5 tabs.

797 (IFE/KR/E–94/003) **Nuclear power - status and development 1994.** Lingjaerde, R.O. Institutt for Energiteknikk, Kjeller (Norway). Sep 1994. 15p. (In Norwegian). Order Number DE95606818. Source: OSTI; NTIS; INIS.

The report gives a survey of the preset global position of nuclear power as well as forecasts on the future development in the nuclear energy sector. 7 refs., 3 tabs.

798 (INIS-mf–14369) **Current status of SMPRs and manpower development for nuclear power.** Dias, M.P. Atomic Energy Authority, Colombo (Sri Lanka). 1994. 19p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604083. Source: OSTI; NTIS (US Sales Only); INIS.

The development of SMPRs could make it possible for countries with small electrical grids to use nuclear power. SMPRs are still in the developing stages and none of them have the capability of good plant performance. Most of the SMPRs are in the 300 MWe range and a grid capacity of at least 2000 MWe would be required before such a power plant can be connected to the grid. There is a possibility that SMPRs could generate electricity cheaper than coal plants requiring desulphurization. An unexpected increase in coal price and adverse environmental effects could make it necessary to use nuclear power in the future. Qualified manpower is required to plan, build and properly operate a nuclear power plant; and the availability of qualified manpower is a pre-condition for deciding to use nuclear power. There is a possibility that Sri Lanka would be able to use nuclear power in the next 15-20 years and a total dependence upon foreign expertise is neither possible nor desirable. Therefore pre-project activities should be considering such things as teaching nuclear science and engineering in the universities and retraining existing professionals, say from the coal power industry. Adequate emphasis must be given to manpower development and to the need to scheduling this development.

799 (INIS-mf–14372) **Case Studies.** Siyambalapitiya, D.J.T. Ceylon Electricity Board, Colombo (Sri Lanka). 1994. 11p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604085. Source: OSTI; NTIS (US Sales Only); INIS.

Proven options available to Sri Lanka for large scale electricity generation in the future are coal-fired thermal, oil-fired thermal and Nuclear. Four case studies for groups participated are indicated. Case study for group 1 is comparison of the three options by taking into consideration the capital and recurrent expenditure involved. Environmental effects of the three options are also given. Case study for group 2 is economic comparison of three renewable energy based power generation system. Case study for group 3 is based on energy conservation, efficiency, improvement and demand management. Assuming that a continuous saving of 20 MW of demand from 1996 onwards is effective two projects are suggested to achieve this result. Case study for group 4 is a feasibility study for hydro power development of the Kukule Ganga (river) in Sri Lanka. Participants are required to evaluate one of the three optional development concepts which are technically feasible.

800 (INIS-mf–14389) **Summary of operating experience in Swiss nuclear power plants 1993.** Schweizerische Vereinigung fuer Atomenergie, Bern (Switzerland). Jul 1994. 16p. Order Number DE95606824. Source: OSTI; NTIS; INIS.

In 1993 the Swiss nuclear power plants produced their third highest combined annual output. The contribution to the total electricity generation in the country was close to 37%. Replacement of the steam generators in Beznau Unit 1 resulted in a longer than usual annual outage. For the other four units the availability figures were close to, or exceeded, those of previous years. The energy utilization was, however, lowered due to load reduction in autumn resulting from unusually high production by the hydro-electric power plants. The steam generator replacement at Beznau enabled an increase in electrical power of about 2% without increase in reactor power. With the approval of the Swiss government in

December 1992, the output of the Muehleberg power plant was increased in two stages by a total of 10%. The application for an unlimited operating license for Beznau Unit 2, and for a power uprate at the Leibstadt power plant, are still pending. The average number of scrams at the Swiss plants remained stable, at less than one scram per reactor year. As a result of experience in the Swedish nuclear power plant at Barsebaeck, the suction strainers of the emergency core cooling systems of the boiling water reactors at Muehleberg and Leibstadt were replaced by strainers with larger surface areas. The re-inspection of crack indications previously detected in the core shroud of the Muehleberg reactor and the penetration tubes in the reactor pressure vessel closure head of Beznau revealed no growth during the intervening operating periods. Following the completion of installation activities during the annual outages at Beznau Unit 1, Goesgen and Leibstadt, all Swiss nuclear power plants are now equipped with filtered containment venting systems. (author) figs., tabs.

22 NUCLEAR REACTOR TECHNOLOGY

Refer also to citation(s) 861, 1152, 2455, 2487, 2514

2201 Theory and Calculation

Refer also to citation(s) 788, 859

801 (EGG-NRE–11406) **NESTLE: Few-group neutron diffusion equation solver utilizing the nodal expansion method for eigenvalue, adjoint, fixed-source steady-state and transient problems.** Turinsky, P.J. (North Carolina State Univ., Raleigh, NC (United States)); Al-Chalabi, R.M.K.; Engrand, P.; Sarsour, H.N.; Faure, F.X.; Guo, W. EG and G Idaho, Inc., Idaho Falls, ID (United States); Los Alamos National Lab., NM (United States). Jun 1994. 147p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570 ; W-7405-ENG-36. Order Number DE95001903. Source: OSTI; NTIS; INIS; GPO Dep.

NESTLE is a FORTRAN77 code that solves the few-group neutron diffusion equation utilizing the Nodal Expansion Method (NEM). NESTLE can solve the eigenvalue (criticality); eigenvalue adjoint; external fixed-source steady-state; or external fixed-source. or eigenvalue initiated transient problems. The code name NESTLE originates from the multi-problem solution capability, abbreviating Nodal Eigenvalue, Steady-state, Transient, Le core Evaluator. The eigenvalue problem allows criticality searches to be completed, and the external fixed-source steady-state problem can search to achieve a specified power level. Transient problems model delayed neutrons via precursor groups. Several core properties can be input as time dependent. Two or four energy groups can be utilized, with all energy groups being thermal groups (i.e. upscatter exits) if desired. Core geometries modelled include Cartesian and Hexagonal. Three, two and one dimensional models can be utilized with various symmetries. The non-linear iterative strategy associated with the NEM method is employed. An advantage of the non-linear iterative strategy is that NSTLE can be utilized to solve either the nodal or Finite Difference Method representation of the few-group neutron diffusion equation.

802 (EGG-RAAM–11041) **Hits per trial: Basic analysis of binomial data.** Atwood, C.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 70p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001974. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents simple statistical methods for analyzing binomial data, such as the number of failures in some number of demands. It gives point estimates, confidence intervals, and Bayesian intervals for the failure probability. It shows how to compare subsets of the data, both graphically and by statistical tests, and how to look for trends in time. It presents a compound model when the failure probability varies randomly. Examples and SAS programs are given.

803 (EGG-RAAM–11088) **Events in time: Basic analysis of Poisson data.** Engelhardt, M.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 64p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002032. Source: OSTI; NTIS; INIS; GPO Dep.

The report presents basic statistical methods for analyzing Poisson data, such as the member of events in some period of time. It gives point estimates, confidence intervals, and Bayesian intervals for the rate of occurrence per unit of time. It shows how to compare subsets of the data, both graphically and by statistical tests, and how to look for trends in time. It presents a compound model when the rate of occurrence varies randomly. Examples and SAS programs are given.

2202 Components and Accessories

Refer also to citation(s) 871, 874, 879, 883, 1160, 1162, 1450

804 (AREAEE–285) **Reactor elements properties response during a postulated loss-of-coolant accident (LOCA).** Ahmed, E.E.; Rahman, F.A. Nuclear Research Centre, Inshas (Egypt). 1985. 78p. Order Number DE95606473. Source: OSTI; NTIS (US Sales Only); INIS.

Four computer algorithms have been introduced to solve for the reactor different materials response subjected to LOCA conditions, they were developed with the intent of producing a simple, accurate and efficient prediction schemes. A general overview of the solution procedures design and working of each of four algorithms are presented, followed by short description of the nature of solution and calculated results. These algorithms are: 1. ZIRCP to give the cladding material properties response under normal and transient conditions. 2. FCGAPP to give the fuel- cladding gas-gap conductivity. 3. NFUEIP to solve the temperature dependent of nuclear fuel properties during normal and transient conditions. 4. TSDATP has been developed to solve for the thermodynamic and transport properties of water and steam over a large range of temperature and pressure. 14 fig.

805 (AREAEE–287) **Confinements systems in nuclear facilities other than nuclear reactors.** Souka, N. Nuclear Research Centre, Inshas (Egypt). 1985. 15p. Order Number DE95606474. Source: OSTI; NTIS (US Sales Only); INIS.

This report represents the problem of confinement system in nuclear facilities other than nuclear reactors. The presentation deals with the regulations to be adopted in applying for a licence to construct or operate such facilities. It specifies in particular the requirements to be fulfilled in physical and treatment barriers. The outlined regulations and requirements are deduced form the 10-CFR (Vol. 10 of the code of federal regulations-USA) and the related US-NRC regulatory guides. The USA-system has world wide application, since most countries have not developed their own national code in what concerns nuclear facilities other than nuclear reactors.

806 (CONF-9408170–2) **The Plant-Window system: A flexible, expandable computing environment for the integration of power plant activities.** Wood, R.T. (Oak Ridge National Lab., TN (United States)); Mullens, J.A.; Naser, J.A. Oak Ridge National Lab., TN (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC05-84OR21400. From Distributed digital systems workshop on plant process computer and networks; Charlotte, NC (United States); 16-18 Aug 1994. Order Number DE95001427. Source: OSTI; NTIS; INIS; GPO Dep.

Power plant data, and the information that can be derived from it, provide the link to the plant through which the operations, maintenance and engineering staff understand and manage plant performance. The increasing use of computer technology in the US nuclear power industry has greatly expanded the capability to obtain, analyze, and present data about the plant to station personnel. However, it is necessary to transform the vast quantity of available data into clear, concise, and coherent information that can be readily accessed and used throughout the plant. This need can be met by an integrated computer workstation environment that provides the necessary information and software applications,

in a manner that can be easily understood and used, to the proper users throughout the plant. As part of a Cooperative Research and Development Agreement with the Electric Power Research Institute, the Oak Ridge National Laboratory has developed functional requirements for a Plant-Wide Integrated Environment Distributed on Workstations (Plant-Window) System. The Plant-Window System (PWS) can serve the needs of operations, engineering, and maintenance personnel at nuclear power stations by providing integrated data and software applications (e.g., monitoring, analysis, diagnosis, and control applications) within a common environment. The PWS requirements identify functional capabilities and provide guidelines for standardized hardware, software, and display interfaces to define a flexible computer environment that permits a tailored implementation of workstation capabilities and facilitates future upgrades.

807 (DOE/ER/12130–T1) **Feasibility of a novel approach for fast, economical determination of radiation damage in nuclear reactor cores: Progress report, [November 1, 1993–October 31, 1994].** Was, G.S. Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering. 30 Jun 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER12130. Order Number DE95002598. Source: OSTI; NTIS; INIS; GPO Dep.

Progress has been made in several areas in the second year of grant activity. This includes radiation induced segregation (modeling and experiment), deformation of the irradiated microstructure and stress corrosion cracking of irradiated microstructures.

808 (INIS-GB–640) **A RWMAC commentary on the Science Policy Research Unit report: UK nuclear decommissioning policy: time for decision.** Radioactive Waste Management Advisory Committee, London (United Kingdom). Apr 1994. 15p. Order Number DE95606475. Source: OSTI; NTIS (US Sales Only); INIS.

Chapter 4 of the RWMAC's Twelfth Annual Report discussed nuclear power plant decommissioning strategy. One of the RWMAC's conclusions was that the concept of financial provisioning for power station decommissioning liabilities, which might be passed on to society several generations into the future, deserved further study. A specification for such a study was duly written (Annex 2) and, following consideration of tendered responses, the Science Policy Research Unit (SPRU) at Sussex University, was contracted to carry out the work. The SPRU report stands as a SPRU analysis of the subject. This separate short RWMAC report, which is being released at the same time as the SPRU report, presents the RWMAC's own commentary on the SPRU study. The RWMAC has identified five main issues which should be addressed when deciding on a nuclear plant decommissioning strategy. These are: the technical approach to decommissioning, the basis of financial provisions, treatment of risk, segregation of management of funds, and the need for a wider environmental view. These issues are addressed in this RWMAC report. (author).

809 (KFK–5362) **Discussion of plastic instabilities of a pressure vessel by means of the finite element method.** Laemmer, H.; Ritter, B.; Tsakmakis, C. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung. Jun 1994. 86p. (In German). Order Number DE95711312. Source: OSTI; NTIS (US Sales Only); INIS.

In this report the influence of geometrical and thermal imperfections on the load-carrying capacity of pressure vessels has been studied by means of the ABAQUS finite element code. Using a thermo-plasticity model for finite strains failure due to plastic instability has been investigated. The parameters needed for this model were identified with uniaxial tensile tests. The parameters were fitted in such a way that necking of the tensile rod was described in a satisfactory manner. Starting from the tensile rod the influence of imperfections on necking of a structure is discussed. Axisymmetric and three dimensional calculations showed that for a sufficient size of the imperfection necking can be obtained. As expected, the maximum internal pressure at failure and the beginning of localization of plastic deformations depend on the size of the imperfection. (orig.)

810 (NUREG/CR–6228) **Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams.** Keeney, J.A. (Oak Ridge National Lab., TN (United States)); Bass, B.R.; McAfee, W.J.; Iskander, S.K. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Oct 1994. 54p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12735). Source: OSTI; NTIS; INIS; GPO.

This report describes a testing program that utilizes full-thickness clad beam specimens to quantify fracture toughness for shallow cracks in material for which metallurgical conditions are prototypic of those found in reactor pressure vessels (RPVs). The beam specimens are fabricated from a section of an RPV wall (removed from a canceled nuclear plant) that includes weld, plate, and clad material. Metallurgical factors potentially influencing fracture toughness for shallow cracks in the beam specimens include material gradients due to welding and cladding applications, as well as material inhomogeneities in welded regions due to reheating in multiple weld passes. A summary of the testing program includes a description of the specimen geometry, material properties, the testing procedure, and the experimental results form three specimens. The yield strength of the weld material was determined to be 36% higher than the yield strength of the base material. An irradiation-induced increase in yield strength of the weld material could result in a yield stress that exceeds the upper limit where code curves are valid. The high yield strength for prototypic weld material may have implications for RPV structural integrity assessments. Analyses of the test data are discussed, including comparisons of measured displacements with finite-element analysis results, applications of toughness estimation techniques, and interpretations of constraint conditions implied by stress-based constraint methodologies. Metallurgical conditions in the region of the cladding heat-affected zone are proposed as a possible explanation for the lower-bound fracture toughness measured with one of the shallow-crack clad beam specimens. Fracture toughness data from the three clad beam specimens are compared with other shallow- and deep-crack uniaxial beam and cruciform data generated previously from A 533 Grade B plate material.

811 (NUREG/CR–6281) **A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping.** Gamble, R.M. (NOVETECH Corp., Rockville, MD (United States)); Zahoor, A.; Ghassemi, B. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; NOVETECH Corp., Rockville, MD (United States). Oct 1994. 44p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

A simplified procedure has been defined for computing the allowable circumferential throughwall crack length as a function of applied loads in piping. This procedure has been defined to enable leak-before-break (LBB) evaluations to be performed without complex and time consuming analyses. The development of the LBB evaluation procedure is similar to that now used in Section 11 of the ASME Code for evaluation of part-throughwall flaws found in piping. The LBB evaluation procedure was bench marked using experimental data obtained from pipes having circumferential throughwall flaws. Comparisons of the experimental and predicted load carrying capacities indicate that the method has a conservative bias, such that for at least 97% of the experiments the experimental load is equal to or greater than 90% of the predicted load. The procedures described in this report are applicable to pipe and pipe fittings with: (1) wrought austenitic steel (Ni-Cr-Fe alloy) having a specified minimum yield strength less than 45 ksi, and gas metal-arc, submerged arc and shielded metal-arc austenitic welds, and (2) seamless or welded wrought carbon steel having a minimum yield strength not greater than 40 ksi, and associated weld materials. The procedures can be used for cast austenitic steel when adequate information is available to place the cast material toughness into one of the categories identified later in this report for austenitic wrought and weld materials.

812 (SAND–94-0146) **An evaluation of the fire barrier system thermo-lag 330-1.** Nowlen, S.P. (Sandia National Labs., Albuquerque, NM (United States). Components and Structures Safety and Reliability); Ross, S. Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 204p. Sponsored by

Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001508. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of three fire endurance tests and one ampacity derating test set of the fire barrier system Thermo-Lag 330-1 Subliming Coating. Each test was performed using cable tray specimens protected by a nominal three-hour fire barrier envelope comprised of two layers of nominal 1/2 inch thick material. The fire barrier systems for two of the three fire endurance test articles and for the ampacity derating test article were installed in accordance with the manufacturer's installations procedures. The barrier system for the third fire endurance test article was a full reproduction of one of the original manufacturer's qualification test articles. This final test article included certain installation enhancements not considered typical of current nuclear power plant installations. The primary criteria for fire endurance performance evaluation was based on cable circuit integrity testing. Secondary consideration was also given to the temperature rise limits set forth in the ASTM E119 standard fire barrier test procedure. All three of the fire endurance specimens failed prematurely. Circuit integrity failures for the two fire endurance test articles with procedures-based installations were recorded at approximately 76 and 59 minutes into the exposures for a 6 inch wide and 12 inch wide cable tray respectively. Temperature excursion failures (single point) for these two test articles were noted at approximately 65 and 56 minutes respectively. The first circuit integrity failure for the full reproduction test article was recorded approximately 119 minutes into the exposure, and the first temperature excursion failure for this test article was recorded approximately 110 minutes into the exposure.

813 (WSRC-TR–94-0449) **Analysis of welds on helium-containing restraint test plates.** Kanne, W.R. Jr.; Chandler, G.T. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001809. Source: OSTI; NTIS; GPO Dep.

Over the last several years, Savannah River has had the goal of developing a repair process and the technical understanding necessary to make weld repairs on stainless steel containing helium. This report documents the results of a series of test welds made with varying amounts of mechanical restraint on type 304 stainless steel containing helium from tritium decay. This change in restraint produced different states of stress on the weld area during welding. The test welds were either overlay welds or weave beads. The amount of heat affected zone cracking observed in the welds provided the primary, analysis tool for evaluating the tests. Generally, higher restraint produced greater cracking of the welds. These results, along with previous Savannah River data, indicate that in a practical application of a repair method for helium-containing stainless steel, the effect of part configuration must be considered, as well as the type of weld, to reduce stresses that can cause helium embrittlement cracking.

2203 Fuel Elements

Refer also to citation(s) 607, 791, 856, 864

814 (CEA-CONF–11786) **Radiation shielding calculation for the MOX fuel fabrication plant Melox.** Lee, Y.K. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie); Nimal, J.C.; Degrange, J.P.; Chiron, M. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. de Mecanique et de Technologie. 1994. 8p. (CONF-940424–: 8. international conference on radiation shielding, Arlington, TX (United States), 24-27 Apr 1994). Order Number DE95606494. Source: OSTI; NTIS (US Sales Only); INIS.

Radiation shielding calculation is an important engineering work in the design of the MOX fuel fabrication plant MELOX. Due to the recycle of plutonium and uranium from UO2 spent fuel reprocessing and the large capacity of production (120t HM/yr.), the shielding design requires more attention in this LWR fuel plant. In MELOX, besides several temporary storage facilities of massive fissile material, about one thousand radioactive sources with different geometries, forms, densities, quantities and Pu concentrations, are distributed through different workshops from the PuO_2 powder reception unit to the fuel assembly packing room. These sources, with or without close shield, stay temporarily in different locations, containers and glove boxes. In order to optimize the dimensions, the material and the cost of shield as well as to limit the calculation work in a reasonable engineer-hours, a calculation scheme for shielding design of MELOX is developed. This calculation scheme has been proved to be useful in consideration of the feedback from the evolutionary design and construction. The validated shielding calculations give a predictive but reliable radiation doses information. (authors). 2 figs., 10 refs.

815 (DPW–53-1247-Del.Ver.) **Trip report, Metals and Controls Corporation, Attleboro, Mass. – September 3, 1953.** Pocalyko, A. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Atomic Energy Div. 23 Sep 1953. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–829). Order Number DE95001998. Source: OSTI; NTIS; GPO Dep.

The visit was made to discuss progress on bonding and cladding of extended surface fuel elements.

816 (EGG-M–94222) **Corrosion of spent Advanced Test Reactor fuel.** Lundberg, L.B.; Croson, M.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-941207–9: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95002010. Source: OSTI; NTIS; INIS; GPO Dep.

The results of a study of the condition of spent nuclear fuel elements from the Advanced Test Reactor (ATR) currently being stored underwater at the Idaho National Engineering Laboratory (INEL) are presented. This study was motivated by a need to estimate the corrosion behavior of dried, spent ATR fuel elements during dry storage for periods up to 50 years. The study indicated that the condition of spent ATR fuel elements currently stored underwater at the INEL is not very well known. Based on the limited data and observed corrosion behavior in the reactor and in underwater storage, it was concluded that many of the fuel elements currently stored under water in the facility called ICPP-603 FSF are in a degraded condition, and it is probable that many have breached cladding. The anticipated dehydration behavior of corroded spent ATR fuel elements was also studied, and a list of issues to be addressed by fuel element characterization before and after forced drying of the fuel elements and during dry storage is presented.

817 (JAERI-Research–94-006) **Behavior of pre-irradiated fuel under a simulated RIA condition: Results of NSRR test JM-3.** Fuketa, Toyoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Sasajima, Hideo; Mori, Yukihide. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 104p. Order Number DE95709893. Source: OSTI; NTIS; INIS.

This report presents results from the power burst experiment with pre-irradiated fuel rod, Test JM-3, conducted in the Nuclear Safety Research Reactor (NSSR). The data concerning test method, pre-irradiation, pre-pulse fuel examination, pulse irradiation, transient records and post-pulse fuel examination are described, and analyses, interpretations, and discussions of the results are presented. Preceding to the pulse irradiation in the NSRR, test fuel rod was irradiated in the Japan Materials Testing Reactor (JMTR) up to a fuel burnup of 19.6MWd/kgU with average linear heat rate of 25.3 kW/m. The fuel rod was subjected to the pulse irradiation resulting in a deposited energy of 174±6 cal/g·fuel and a peak fuel enthalpy of 130±5 cal/g·fuel under stagnant water cooling condition at atmospheric pressure and ambient temperature. Test fuel rod behavior was assessed from pre- and post-pulse fuel examinations and transient records during the pulse. The cladding surface temperature increased to only 150degC, and the test resulted in slight fuel deformation and no fuel failure. An estimated rod-average fission gas release during the transient was about 2.2%. Through the detailed fuel examinations, the information concerning microstructural change in the fuel pellets were also obtained. (author).

818 (JAERI-Tech–94-010) **Development of a rapid gelation apparatus with microwave heating.** Yamagishi, Shigeru (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai

Research Establishment); Ogawa, Toru; Hasegawa, Atsushi. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 39p. (In Japanese). Order Number DE95709888. Source: OSTI; NTIS; INIS.

In the internal gelation process for fabricating ceramic fuel microspheres, hexamethylenetetramine (HMTA) is added to the source solution, and then the droplets of the solution are heated to decompose the HMTA into ammonia and gelled homogeneously. For the heating, a rapid gelation apparatus was developed, which enabled the temperature of the droplets increase around 80K during a short time of their fall through its heating cavity. A commercial power supply for dielectric heating by using microwave with a frequency of 2.45GHz assigned to industrial uses, was used with a little improvement. The gel microspheres containing uranium were prepared by using this rapid gelation apparatus. (author).

819 (Y/DV–1353) **Clad vent set cup open end (closure weld zone) wall-thickness study.** Ulrich, G.B.; Sherrill, M.W. Oak Ridge National Lab., TN (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95002053. Source: OSTI; NTIS; GPO Dep.

The wall thickness at the open end of Clad Vent Set (CVS) cups is a very important parameter for maintaining control of the fueled CVS closure weld process. Ideally, the wall thickness in the closure weld zone should be constant. The DOP-26 iridium alloy is very difficult to machine; therefore, key dimensional features are established during the two-draw warm-forming operation. Unfortunately, anisotropy in the forming blanks produces four ears at the open end of each cup. Formation of these ears produces axial and circumferential variations in wall thickness. The cup certification requirement is that the wall thickness in the closure weld zone, defined as the 2.5-mm band at the open end of a cup, measure from 0.63 to 0.73 mm. The wall thickness certification data for the open end of the CVS cups have been statistically evaluated. These data show that the cups recently produced for the Cassini mission have well-controlled open-end wall thicknesses.

2204 Control Systems

Refer also to citation(s) 2494, 2495

820 (ANL/RE/CP–80730) **Cooperative research and development for artificial intelligence based reactor diagnostic system.** Reifman, J. (Argonne National Lab., IL (United States)); Wei, T.Y.C.; Abboud, R.G.; Chasensky, T.M. Argonne National Lab., IL (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940445–8: 56. annual American power conference, Chicago, IL (United States), 25-27 Apr 1994). Order Number DE95001430. Source: OSTI; NTIS; INIS; GPO Dep.

Artificial Intelligence (AI) techniques in the form of knowledge-based Expert Systems (ESs) have been proposed to provide on-line decision-making support for plant operators during both normal and emergency conditions. However, in spite of the great interest in these advanced techniques, their application in the diagnosis of large-scale processes has not yet reached its full potential because of limitations of the knowledge base. These limitations include problems with knowledge acquisition and the use of an event-oriented approach for process diagnosis. To investigate the capabilities of this two-level hierarchical knowledge structure, Commonwealth Research Corporation (CRC) and Argonne National Laboratory (ANL)are collaborating on a DOE-sponsored Cooperative Research and Development Agreement (CRADA) project to perform feasibility studies on the proposed diagnostic system. Investigations are being performed in the construction of a physics-based plant level process diagnostic ES and the characterization of component-level fault project is to develop a computer-based system using this AI approach to assist process plant operators during off-normal plant conditions. The proposed computer-based system will use T-H signals complemented by other non-T-H signals available in the data stream to provide the process operator with the component which most likely caused the observed process disturbance. To demonstrate the scale-up feasibility of the proposed diagnostic system it is being developed for use with the Chemical Volume Control System (CVCS) of a nuclear power plant. This is an ongoing multi-year project and the remainder of this paper presents a mid-term status report.

821 (AREAEE–303) **Highly reliable computer network for real time system.** Mohammed, F.A.; Omar, A.A.; Ayad, N.M.A.; Madkour, M.A.I.; Ibrahim, M.K. Nuclear Research Centre, Inshas (Egypt). 1988. 48p. Order Number DE95606502. Source: OSTI; NTIS (US Sales Only); INIS.

Many of computer networks have been studied different trends regarding the network architecture and the various protocols that govern data transfers and guarantee a reliable communication among all a hierarchical network structure has been proposed to provide a simple and inexpensive way for the realization of a reliable real-time computer network. In such architecture all computers in the same level are connected to a common serial channel through intelligent nodes that collectively control data transfers over the serial channel. This level of computer network can be considered as a local area computer network (LACN) that can be used in nuclear power plant control system since it has geographically dispersed subsystems. network expansion would be straight the common channel for each added computer (HOST). All the nodes are designed around a microprocessor chip to provide the required intelligence. The node can be divided into two sections namely a common section that interfaces with serial data channel and a private section to interface with the host computer. This part would naturally tend to have some variations in the hardware details to match the requirements of individual host computers. fig 7.

822 (BNWL-CC–608) **Planned mode of operation – PRTR chemical shim.** Smith, R.I.; Lewis, W.R. Battelle-Northwest, Richland, WA (United States). Pacific Northwest Lab. 30 Mar 1966. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001342. Source: OSTI; NTIS; GPO Dep.

This report is divided into the following areas: general process control; reactor reactivity control; and projected operating costs. The section on general process control discusses routine moderator sampling and routine reactivity status determinations. Areas discussed under reactor reactivity control are cold startup operation, hot startup control, and power operation. Operating costs cover BIX resin, boron cost, and IX-3 cost.

823 (CEA-CONF–11803) **OSIRIS: the first M.T.R. with a new instrumentation and control system based on digital logic of vote.** Joly, C.; Thiercelin, C.; Corre, J.; Dubois, J.F.; Contenson, G. de. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Reacteurs Experimentaux. 1993. 16p. (CONF-9309439–: 3. Meeting of the International Group on Research Reactors, Naka-Machi (Japan), 30 Sep - 1 oct 1993). Order Number DE95606503. Source: OSTI; NTIS (US Sales Only); INIS.

OSIRIS, one of the french C.E.A. research reactors located at SACLAY, near PARIS, is since 27 years mainly devoted to production and irradiation technologies. To satisfy these objectives, OSIRIS is equipped by different test sections allowing mainly: - the long time irradiation of different materials including fuel rods, reactor vessel materials, fusion reactor components, - the power ramps of fuel rods, the Silicon doping, the radioelements production, the neutronography of materials and test sections. In most of the loops, the nuclear reactor conditions are fully simulated to approach as far as possible the exact behaviour of the materials. Through the new irradiation facilities under development, let's cite the OPERA test section foreseen for the simultaneous irradiation of 32 fuel rods with a maximum length of 2 m. To guarantee the safety and the high performances of the reactor, a continuous maintenance and improvement programme took place during the whole life of the reactor. The paper gives an overview of the part of this programme devoted to the replacement of the instrumentation and control system of the reactor. After 5 years study and development, the on site work took place in the second part of 1992 allowing a reactor start up beginning of 1993. (authors). 10 figs.

824 (CEA-CONF–11804) **Dynamic compensation of the silver self-powered neutron detector in the ramp program at Osiris reactor.** Moulin, D.J. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. des Reacteurs Experimentaux. 1993. 8p. (CONF-930809–: 8. ASTM-EURATOM symposium on reactor

dosimetry, Vail, CO (United States), 29 Aug - 3 sep 1993). Order Number DE95606504. Source: OSTI; NTIS (US Sales Only); INIS.

The Silver self-powered neutron detector (SSPND) is a common detector used in the ramp program at OSIRIS reactor. SSPND signal is a reference during steady states, but its response is too slow for monitoring transient tests. In order to compensate for the inherent time delay a mathematical processing of the SSPND signal was developed. Based on a convolution-type resolution of the kinetics equations, a dynamic compensation algorithm can be used for transient conditions as well as steady state conditions. A computer program reconstructs, in real-time, the dynamic neutron flux sensed by the silver detector from the current measured between the emitter and the collector of the SSPND. Although this method decreases slightly the signal-to-noise ratio, it keeps the SPND's characteristics, except the response time which is dragged down from about 10 minutes to less than 4 seconds for a step change in the flux. This provides for prompt and accurate measurement of fuel rod power during ramp experiments in OSIRIS reactor, but this development makes the SSPND very suitable for other kind of non-line monitoring systems. (author). 4 figs., 3 refs.

825 (DPW–53-1362-Del.Ver.) **Project 8980, Savannah River Plant, 105-C power calculator.** Cist, J.D. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 9 Nov 1953. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–834). Order Number DE95002286. Source: OSTI; NTIS; GPO Dep.

A meeting was held on October 29, 1953, to decide upon the arrangement of the flow-temperature-rise power calculator for 105-C. The following proposals were under discussion: (1) Install twelve computer elements, one associated with each heat exchanger, and make the necessary flow and temperature-rise measurements for each. (2) Group the heat exchangers in pairs by installing short sub-headers at their inlet and outlet ends. (3) Have exchangers installed as in Proposal 1. Make measurements on only one unit of each heat exchanger pair and double the calculated value, under the assumption that both units will operate alike. (4) Leave the exchangers arranged as in Proposal 1 and measure flow and temperature-rise in the two main inlet cooling water headers. It was decided to adopt Proposal 4 because of its simplicity and because it minimizes cooling water system pressure-drop.

826 (HW–69000-V2A) **100-N technical manual: Volume 2A: Systems descriptions.** General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 1963. 498p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001338. Source: OSTI; NTIS; GPO Dep.

This report contains engineering drawings for the control room, reactor monitoring systems, and reactor control systems for the N reactor. Each console in the control room is detailed. Other systems discussed are: stack air monitoring system, charging machine control systems, and heating and ventilation control systems. A N reactor plant glossary is included.

827 (IAEA/NENP/TC–93/1) **Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.** International Atomic Energy Agency, Vienna (Austria). 1993. 401p. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document contains summaries of the presentations prepared for the IAEA Review Meeting "Training for the Qualification and Competence of Nuclear Power Plant Personnel". The individual contributors have been indexed separately for the database. Refs, figs and tabs.

828 (IAEA/NENP/TC–93/2) **Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.** International Atomic Energy Agency, Vienna (Austria). 1993. 406p. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

A Technical Cooperation Meeting on Training-Related Activities for NPP Personnel in the Countries of Central and Eastern Europe and the Former Soviet Union was held at the IAEA, Vienna. The main objective of the meeting was to identify, through information exchange and discussion, possible TC projects and assistance related to nuclear power plant (NPP) personnel training, which would meet overall coherent national goals and would demonstrate and important impact and relevance for national policy priorities. An array of such projects were identified for each participating country of the CEEC and FSU as were a number of regional cooperation projects. Refs, figs and tabs.

829 (INIS-mf–14313, pp. 245-283) **Nuclear reactor kinetics.** Shaat, M.K. Arab Atomic Energy Agency (AAEA), Tunis (Tunisia); Atomic Energy Establishment, Cairo (Egypt). 1993. 766p. (CONF-9309380–: A seminar on physics and technology of nuclear reactors, Cairo (Egypt), 11 Sep 1993). In *Proceedings of the symposium on the physics and technology of reactors.* Order Number DE95603392. Source: OSTI; NTIS (US Sales Only); INIS.

For a nuclear reactor to operate at a constant power level, the rate of neutron production should be balanced by neutron loss via absorption leakage. Any deviation from this balance condition will result in a time-dependence of power level of the reactor. The items and equations describing the time-dependent behavior of nuclear reactors will be studied and analyzed. Also, the reactor transfer function will be evaluated. 12 fig.

830 (NUREG/CR–6105) **Human factors engineering guidance for the review of advanced alarm systems.** O'Hara, J.M. (Brookhaven National Lab., Upton, NY (United States)); Brown, W.S.; Higgins, J.C.; Stubler, W.F. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Brookhaven National Lab., Upton, NY (United States). Sep 1994. 110p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52391). Source: OSTI; NTIS; INIS; GPO.

This report provides guidance to support the review of the human factors aspects of advanced alarm system designs in nuclear power plants. The report is organized into three major sections. The first section describes the methodology and criteria that were used to develop the design review guidelines. Also included is a description of the scope, organization, and format of the guidelines. The second section provides a systematic review procedure in which important characteristics of the alarm system are identified, described, and evaluated. The third section provides the detailed review guidelines. The review guidelines are organized according to important characteristics of the alarm system including: alarm definition; alarm processing and reduction; alarm prioritization and availability; display; control; automated; dynamic, and modifiable characteristics; reliability, test, maintenance, and failure indication; alarm response procedures; and control-display integration and layout.

831 (NUREG/CR–6146) **Local control stations: Human engineering issues and insights.** Brown, W.S. (Brookhaven National Lab., Upton, NY (United States)); Higgins, J.C.; O'Hara, J.M. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Brookhaven National Lab., Upton, NY (United States). Sep 1994. 69p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52400). Source: OSTI; NTIS; GPO; INIS.

The objective of this research project was to evaluate current human engineering at local control stations (LCSs) in nuclear power plants, and to identify good human engineering practices relevant to the design of these operator interfaces. General literature and reports of operating experience were reviewed to determine the extent and type of human engineering deficiencies at LCSs in nuclear power plants. In-plant assessments were made of human engineering at single-function as well as multifunction LCSs. Besides confirming the existence of human engineering deficiencies at LCSs, the in-plant assessments provided information about the human engineering upgrades that have been made at nuclear power

plants. Upgrades were typically the result of any of three influences regulatory activity, broad industry initiatives such as INPO, and specific in-plant programs (e.g. activities related to training). It is concluded that the quality of LCSs is quite variable and might be improved if there were greater awareness of good practices and existing human engineering guidance relevant to these operator interfaces, which is available from a variety of sources. To make such human engineering guidance more readily accessible, guidelines were compiled from such sources and included in the report as an appendix.

2205 Environmental Aspects

Refer also to citation(s) 447, 448, 633, 637, 742, 1701

832 (AAEC/E–242) **Effects on the surrounding population of postulated major accidents at the AAEC Research Establishment.** Button, J.C.E.; Carruthers, E.; Cook, J.E.; Crancher, D.W.; Davy, D.R. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Nov 1972. 91p. Order Number DE95606172. Source: OSTI; NTIS (US Sales Only); INIS.

Until 1994 this report has been available only for 'limited distribution'.

The consequences of accidents in specific facilities at the Research Establishment are examined in terms of possible exposure of persons living around Lucas Heights to release airborne radioactive and toxic materials. In the case of radioactive materials, both individual and population doses are estimated, the latter over a range of meteorological conditions. Using currently available data on the risk of development of adverse effects in irradiated populations further estimates are made of the possible number of cases of such effects in the local population. 43 refs., 14 tabs., 3 figs.

833 (AREAEE–290) **Review of the main results of source terms studies under core melting conditions.** Souka, N. Nuclear Research Centre, Inshas (Egypt). 1985. 34p. Order Number DE95606168. Source: OSTI; NTIS (US Sales Only); INIS.

Hypothetical core melt accidents in LWRs are not subject to licensing procedures in many countries. However, for risk assessment purposes the so-called radioactive source terms for LWR are of essential significance. It is the major goal of risk studies to make the public acquainted with the importance of the risk of make the public acquainted with the importance of the risks of nuclear power plant operation. Although the probabilities of core melt accidents are extremely low, the public interest concentrates much more on the consequences than the likelihood. The present work is , - a historical revises of source term studies since the widely used US-NRC publication WASH-1400 (1975) up till now, - it describes the current activities in the field, as well as the possible regulatory use of new source terms. 7 tab.

834 (BNWL-CC–979) **Progress report on O2 research and development Mission 14: Columbia River studies, July–December 1966.** Foster, R.F.; Honstead, J.F.; Jaske, R.T. Pacific Northwest Lab., Richland, WA (United States). 30 Dec 1966. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94016508. Source: OSTI; NTIS; GPO Dep.

Columbia River Studies, includes, at this time, a sub-program on "Effluent Activity Reduction" carried out by Douglas United Nuclear, Inc., and two sub-programs "Mechanisms of Environmental Exposure" and "Effects of Reactor Effluent on the Quality of Columbia River Water" carried out by Battelle-Northwest. This semi-annual report is confined to the sub-programs assigned to Battelle-Northwest. Both of the sub-programs covered in this report are concerned with the impact of Hanford effluents on the environment – especially the Columbia River. The "Mechanisms of Environmental Exposure" studies constitutes an invaluable complimentary program to the more routine environmental surveillance program because it provides new or improved knowledge of how and in what quantities radioactive contaminants reach people and contribute to their overall radiation dose. Thus, it provides guidance for the routine sampling and measurements and also provides an improved technical base from which dose calculations can be made. The "Effects of Reactor Effluent on the Quality of Columbia River Water" has been more concerned with heat and toxic chemicals than with radionuclides per se and has dealt especially with the physical processes that affect the distribution and dissipation of heat and chemical additions. Through a combination of field measurements and mathematical modeling a capability is being developed for predicting the downstream effects of a variety of acute or chronic releases under a wide range of river and weather conditions.

835 (BNWL-SA–5493) **New distribution records and notes on the life history and behavior of the sand roller, Percopsis transmontana (Eigenmann and Eigenmann).** Gray, R.H.; Dauble, D.D. Pacific Northwest Lab., Richland, WA (United States). [1975]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001328. Source: OSTI; NTIS; GPO Dep.

This document details information pertaining to a study of fish populations in the Columbia River. The main focus of the study was the sand roller. This fish was found in the Hanford reach of the river. Topics discussed include: The life history and behavior of the fish.

836 (DPW–53-1322) **Project 8980, Savannah River Plant, 200 Area: Water handling system, segregation of process water.** Bird, G.W. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 23 Oct 1953. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–854). Order Number DE95002387. Source: OSTI; NTIS; GPO Dep.

The 200 Area water system was designed to recover the various evaporator overheads and nitric recovery column overhead and separate these streams into process water which might be too active to discard into 4 Mile Creek and discard water which was sufficiently low in activity (exp -11 curies/cc) so it could be sent to 4 Mile Creek. It was planned that the process water could then be used to make up cold feed solutions. The maximum activity was set at (exp -8 curies/cc) in order to prevent a radiation hazard in the cold operating area. Because of butanol build-up in process water, condensate was recovered for use to replace part of the discard water used to balance the process water system. The condensate was not blended with process water but was supplied directly to certain users (1EX and 2BX) to improve decontamination.

837 (INIS-mf–14392, pp. 183-189) **Report of the Chernobyl state committee of the Republic of Belarus.** Rolevitch, V. (Chernobyl State Committee, Minsk (Belarus)); Vasiljeva, I.; Poplyko, I.; Semeshko, A. National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The report of Chernobyl State Committee of the Republic of Belarus contents the results of investigation of Chernobyl accident consequences in several fields of human existence, namely: the environment contamination control especially with long-lived radionuclides, the medical consequences for people and protective measures proposals, agroradiological investigations. To improve the effectiveness of measures designed to combat the consequences of the accident and to create safe living conditions for people the State Programme up to 2000 has been worked out.

838 (PNL-SA–6989) **Diel and seasonal white sturgeon (Acipenser transmontanus) movements in relation to Columbia River temperatures.** Haynes, J.M.; Gray, R.H.; Montgomery, J.C. Pacific Northwest Lab., Richland, WA (United States). May 1978. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001329. Source: OSTI; NTIS; GPO Dep.

Radio-tagged white sturgeon, 12 with temperature sensing transmitters, were monitored, from April through December 1977 in the free-flowing Hanford Reach of the Columbia River. River temperatures appeared to influence diel and seasonal sturgeon movements. In summer, from late afternoon to late evening, sturgeon environmental temperatures were higher than main current

river temperatures. Sturgeon position determinations suggested movements into warmer inshore areas as darkness approached, perhaps to feed. After midnight, recorded sturgeon environmental temperatures declined, indicating movements back to cooler, main channel areas, especially after sunrise. Movements farther than 2 km from release sites did not occur unless water temperatures were above 13°C.

2206 Research, Test, Training, Production, Irradiation, Materials Testing Reactors

Refer also to citation(s) 152, 154, 155, 156, 157, 522, 526, 551, 552, 563, 633, 816, 817, 822, 823, 824, 825, 826, 834, 836, 872, 882, 1506, 2458

839 (ANL/ET/CP–84257) **LEU ^{99}Mo target fabrication and testing: Overview, status, and plans.** Wiencek, T.C.; Hofman, G.L.; Wood, E.L.; Wu, C.T.; Snelgrove, J.L. Argonne National Lab., IL (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409107–3: International meeting on reduced enrichment for research and test reactors, Williamsburg, VA (United States), 18-22 Sep 1994). Order Number DE95001446. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the RERTR program, the development of technology to use low-enriched uranium (LEU) for production of the fission product ^{99}Mo has continued. Progress in fabrication development and out-of-pile thermal testing of targets based on uranium metal foils is summarized. Uranium foil of 125 μm (0.005 in.) thickness has been fabricated. Heat treatments have been developed to provide a random crystal structure, which is required for satisfactory irradiation properties. Two target designs, a tapered thermal expansion type and a split-outer-tube type, are presented. After anionic coating and thermal treatment of prototypical targets, no diffusional or dimensional changes were observed. A formal agreement for cooperation between Argonne National Laboratory (ANL) and the Indonesian National Atomic Energy Agency (BATAN) for irradiation testing is in the final stage of negotiation. The first irradiation tests of targets fabricated by ANL are scheduled to begin during the first half of 1995.

840 (AREAEE–302) **A two dimensional code (R,Z) for nuclear reactor analysis and its application to the UAR-RI reactor.** Bishay, S.T.; Mikhail, I.F.I.; Gaafar, M.A.; Michaiel, M.L.; Nassar, S.F. Nuclear Research Centre, Inshas (Egypt). 1988. 32p. Order Number DE95606626. Source: OSTI; NTIS (US Sales Only); INIS.

A detailed study is given of fuel consumption in completely reflected cylindrical reactors. A two group, two dimensional (r,z) code is developed to carry out the required procedure. The code is applied to the UAR-RI reactor and the results are found to be in complete agreement with the experimental observations and with the theoretical interpretations. 7 fig., 12 tab.

841 (DPW–53-1146-Del.Ver.) **Minutes of Technical Division steering committee meeting August 11, 1953, Wilmington.** Evans, L.C. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 14 Aug 1953. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–832). Order Number DE95002284. Source: OSTI; NTIS; GPO Dep.

Listed in this report are the studies which were approved at the meeting. The studies included the following: nondestructive testing of existing components; 300 area process development; new fuel fabrication; protective coatings for new fuel elements; corrosion studies; 100 Area process development; nondestructive testing of new fuel elements; theoretical physics studies; experimental pile physics studies; 100 Area mechanical development; and Hydriside development. Also included are the information and agreements reached at this meeting.

842 (DPW–53-1311) **Mid-year financial plan, fiscal year 1954 process development.** Squires, L. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 19 Oct 1953. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–855). Order Number DE95002433. Source: OSTI; NTIS; GPO Dep.

Attached are copies of rough drafts of program revisions to be included, in final form, in the December 1st Financial Plan. The attached manpower forecast will appear unchanged in the Plan. The attached cost estimates are broken down into operating, subcontract, and other department charges. Information from the 100, 200, 300, 400, and Weapons Areas is presented.

843 (DPW–54-200-Del.Ver.) **[Discussion by R. M. Evans at a meeting held with the members of the Military Liaison Committee on February 17, 1954].** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 22 Feb 1954. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–828). Order Number DE95001997. Source: OSTI; NTIS; GPO Dep.

Characteristics of the heavy water moderated and cooled reactor when fueled with natural uranium were compared with those of Hanford. The following topics were covered: (1) fundamental safety of the Savannah River Plant reactor and its fundamental efficiency as neutron collector; (2) many critical volumes result in a complex control system and high sensitivity of flux pattern to rod position changes; (3) due to lack of time had to sue slugs initially; (4) had to use D_2O sparingly; (5) effects of circulating cooling system; and (6) heat transfer considerations. Topics also discussed were Savannah River reactor with enriched loadings and irradiation of thorium in lieu of lithium alloy.

844 (DPW–55-15-5) **Minutes of Technical Division Steering Committee Meeting, May 10, 1955, Savannah River Laboratory.** Evans, L.C. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 12 May 1955. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–850). Order Number DE95002383. Source: OSTI; NTIS; GPO Dep.

This document contains Study approvals for 100 Area process development, design and evaluation of fuel elements, theoretical physics, experimental pile physics, and 100 Area mechanical development. Information and agreements that were reached are listed. Information on financial status, the pile engineering program, the physics program, and the status of technical division studies is appended.

845 (DPW–55-16-41) **Weekly report November 18 to December 1, 1955: 300-M Area, Savannah River Plant.** Bloomsburg, M.S. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 1 Dec 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–852). Order Number DE95002385. Source: OSTI; NTIS; GPO Dep.

Short communication. FUEL ELEMENTS/fabrication; PRODUCTION REACTORS/fuel elements; SAVANNAH RIVER PLANT; FABRICATION; FUEL CANS; FUEL RODS; URANIUM

846 (DPW–55-17-4) **Weekly report - 100 Areas - January 27, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 27 Jan 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–911). Order Number DE95002576. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report from the 100 Areas for the week of January 27, 1955. Items discussed include the next four reactor charge configurations as far as cross flow protection is concerned, preliminary testing of aged bulbs in the L area flow monitor trim panel, repairs to the C Thermal Shield supports, testing of the Formsprag Clutch, and purification of moderator for the reactor.

847 (DPW–55-17-9) **Weekly report - 100 Areas - March 3, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 3 Mar 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–909). Order Number DE95002574. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week ending March 3, 1955. Items discussed include strainers for the Hoke dual valves in the R area, supplemental safety device testing in 105-C, work on major design changes to be implemented

during the next reactor down time, recharging procedures for 105-P, procurement of a new deionizer for purification, and handling of slug buckets in the 105-C basin - due to slug length.

848 (DPW–55-17-10) **Weekly report - 100 Areas - March 10, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 10 Mar 1955. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–910). Order Number DE95002575. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of March 10, 1955. Items discussed include procedures for welding cross flow sleeves in quatrefoils, corrosion and erosion inspection of previous quatrefoil weldments, recommended specifications for ID of Q-tubes to meet quality control standards, review of major design changes which need to be implemented during down time, studies on a spiral drum actuator, procurement of larger pumps for moderator circulation, light water leakage at R reactor, changes in the head tank system, design of a system to remove stuck fuel elements, slug bucket vibration for increased bucket loading, purification work for moderator recirculation systems, a refrigeration system to condense lost moderator, and exceptions reports for the reactors.

849 (DPW–55-17-11) **Weekly report - 100 Areas - March 17, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 17 Mar 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–902). Order Number DE95002567. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of March 17, 1955. Items discussed include impact of new fuel element designs on handling problems in the short run, studies of flow monitor noise associated with metering monitor pins, other monitoring devices, design requests for 25,000 GPM pumps for moderator circulators, studies of stresses in the thermal shield tanks due to reactor operations, studies of lubrication of bearings on moderator circulation pumps, and studies of used element handling in buckets, and possible corrosion problems.

850 (DPW–55-17-12) **Weekly report - 100 Areas - March 24, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 24 Mar 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–903). Order Number DE95002568. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of March 24, 1955. Items discussed include the design changes which will be implemented during the next reactor shutdown, and the length of time required to accommodate these updates, discussion of problems associated with motors in the charge and discharge machines, experience with generators used to power instrumentation for the reactors, experience with a Formsprag clutch to avoid pump counterrotation, performance of strainers for retention of UO_2, installation of a density monitor on the moderator circulation system to sense for leaks, and equipment modifications to allow handling of long casks for fuel element transport.

851 (DPW–55-17-13) **Weekly report - 100 Areas - March 31, 1995.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 31 Mar 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE95002569. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of March 31, 1955. Included in this report are discussions of new fuel element designs and preliminary studies, further expansion on the design updates scheduled for the next shutdown, development effort on a settling chamber for collecting UO_2 dust from dual valves on monitor pins, further studies of the motor shaft failure which occurred during testing of the Formsprag clutch, procurement of parts for these clutches, and plant service needs for additional cooling water for the reactors.

852 (DPW–55-17-14) **Weekly report - 100 Areas - April 7, 1955.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 7 Apr 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–905). Order Number DE95002570. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of April 7, 1955. Items discussed include testing of settling chambers to replace strainers in the dual valves of monitor pins, a reorganization of the exceptions reports for the reactors as to responsibility for addressing the problems, flux perturbations in the reactors, temperature variations in the Q-foil channels, possible leaks in the C reactor of light water, design and construction of large pumps for moderator circulation, and variation of heat transfer coefficients in the large heat exchangers.

853 (DPW–55-17-18) **Weekly report - 100 Areas.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). May 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–898). Order Number DE95002563. Source: OSTI; NTIS; GPO Dep.

This is the weekly progress report for the 100 Areas for the week of May 5, 1955. Discussed are items related to receipt of additional Q-foils from a manufacturer for testing, relocation of supplemental safety positions over the reactor matrix, further inspection of corrosion in monitor pins for the reactors, fabrication methods including welding cast halves of large pumps for moderator circulation are being evaluated, review of experience in bending and shearing irradiated LITR fuel plates is reviewed, and design of a central moderator processor facility is proceeding.

854 (DPW–55-17-21) **Weekly report, 100 Areas, May 26, 1955.** Bellas, H.W. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 26 May 1955. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–847). Order Number DE95002380. Source: OSTI; NTIS; GPO Dep.

Short communication. PRODUCTION REACTORS/operation; SAVANNAH RIVER PLANT; REACTOR CONTROL SYSTEMS; OPERATION; REACTOR FUELING; FUEL ELEMENTS

855 (DPW–55-17-22) **Weekly report, 100 Areas, June 2, 1955.** Bellas, H.W. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 2 Jun 1955. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–848). Order Number DE95002381. Source: OSTI; NTIS; GPO Dep.

Short communication. PRODUCTION REACTORS/operation; SAVANNAH RIVER PLANT; OPERATION; TUBES; FUEL ELEMENTS; HEAT TRANSFER; HYDRAULICS

856 (HW–68474) **Revised variable goal exposure plans for C-II-N and C-II-E material.** Bloomstrand, R.R. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 13 Feb 1961. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94017447. Source: OSTI; NTIS; GPO Dep.

Short communication. HANFORD PRODUCTION REACTORS/fuel elements; FUEL ELEMENTS/irradiation; IRRADIATION; FAILURES; RUPTURES; PLANNING

857 (HW–68934) **The low pressure critical flow behavior of steam-water mixtures in constant area flow passages.** Zaloudek, F.R. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 21 Mar 1961. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE94018249. Source: OSTI; NTIS; GPO Dep.

The purpose of this report is to present information gathered in an experimental investigation of the steam-water critical flow phenomenon occurring at the end of a long constant area flow passage. Due to the trend to progressively higher fluid temperatures in nuclear reactor coolant applications and in general industrial processes, there has been much recent attention devoted to a somewhat unique class of problem involving the dynamics of two-phase single component flow. One of these problems, the appearance of a phenomenon resembling critical flow in a gaseous system, is of particular interest in nuclear reactor technology.

858 (HW–83932) **Technical design criteria – PRTR high power density core.** General Electric Co., Richland, WA (United

States). Hanford Atomic Products Operation. 1 Oct 1964. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001340. Source: OSTI; NTIS; GPO Dep.

As set forth in Section III, Bases for Criteria, and in references and, the fuel testing capabilities of the PRTR can be significantly improved and the Plutonium Recycle Program goals can be met more quickly if the specific power is increased. These criteria are formulated on the approach of increasing PRTR specific power by reducing the number of tubes comprising the core and decreasing the length of the fuel element to produce a 70 Mw compact core. In addition to increasing specific power, it is an objective to increase the flexibility of utilization of the reactor by making additional tubes available for fuel and material testing irradiations on the periphery of the core as needed without interfering with programs being pursued in the basic core. To do this, the power rating of the reactor is permitted to increase to 100 Mw to allow up to 30 Mw of power generation in the peripheral tubes.

859 (HW-SA-2984) **The role of exponential and PCTR experiments at Hanford in the design of large power reactors.** Heineman, R.E. General Electric Co., Richland, WA (United States). Hanford Atomic Products Operation. 8 Jul 1963. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-630922-1: International Atomic Energy Agency symposium on exponetial and critical experiments, Amsterdam (Netherlands), 2-6 Sep 1963). Order Number DE94016755. Source: OSTI; NTIS; GPO Dep.

This report discusses the construction and operation of an advanced several region critical facility, the Physical Constants Testing Reactor (PCTR). The PCTR has been used to support the reactor physics design of several power reactors. In addition, the PCTR has served as a general purpose facility for the measurement of reactor cross sections and for the determination of both differential and integral reactor physics parameters for various types of multiplying media. The use of these facilities for power reactor design, to support changes in operation of existing reactors, as reactor physics tools, and as training devices is described. Comparisons are made of the costs of using these facilities in design studies. The development of new experimental techniques for use with these facilities and of the demand for a wider variety of experimental data are traced. A brief description of the High Temperature Lattice Test Reactor is presented and its proposed use is described. Such contrasts and developments are necessary in order to more clearly predict the needs and the future trends in the specific use of such facilities for the support of the design of power reactors.

860 (ILL-RA-1993) **Annual Report 1993.** Institut Max von Laue - Paul Langevin (ILL), 38 - Grenoble (France). 1994. 205p. Order Number DE95606629. Source: OSTI; NTIS (US Sales Only); INIS.

We have examined three points - reorganization, reactor refurbishment and reinstallation of the instruments - which are essential to permit the complete installation to start up in mid-1994, and to operate as required with 5 cycles and 25 instruments. We envisage two cycles in 1994, the first being devoted to the final adjustment of the instruments, and the second being open to the users. Experiment proposals will be examined by the Scientific Council subcommittees in autumn 1994, and we shall allocate the beam time for a first group of 3 cycles, one in 1994 and two in 1995. This restart must be covered by a budget comprising the contributions of the Associates, as provided for in the Protocol to the Intergovernmental Convention and the Memorandum of Understanding signed on 25.3.93, and by those of the scientific member countries. These conditions are somewhat restrictive, and for the time being the ILL must devote its efforts to the return to experimental activity, while the development work has to be resumed more slowly. Under these new conditions we shall only offer the users 25 scheduled instruments. This is less than the number before the shutdown, and we are currently looking for a formula to permit the partial rescheduling of the missing instruments by negotiating conditions for their operation with external groups capable of financing this operation in the context of Collaborating Research Groups (CRGs). (authors).

861 (INIS-mf-14313) **Proceedings of the symposium on the physics and technology of reactors.** Arab Atomic Energy Agency (AAEA), Tunis (Tunisia); Atomic Energy Establishment, Cairo (Egypt). 1993. 766p. (CONF-9309380--: A seminar on physics and technology of nuclear reactors, Cairo (Egypt), 11 Sep 1993). Order Number DE95603392. Source: OSTI; NTIS (US Sales Only); INIS.

The symposium aimed at providing the opportunity for promoting the subject and for developing the human resources in this important field in the Arab States. The symposium included 32 lectures on the following topics related to research reactors: design and development, training and operation, calculations of reactor parameters, nuclear reactions dynamics and control, reactor physics, neutron pyhsics, neutron activation analysis, in-core reactor radiation protection and shielding calculations. The lectures of the symposium were distributed over 7 sessions. An additional session was held by all participants for open discussion and recommendations.

862 (JAERI-Tech-94-004) **Development of irradiation capsule for nuclear research reactor using aromatic polyether (BEK).** Arigane, Kenji (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ohtomo, Akitoshi; Sasajima, Humio; Takahashi, Hidetake; Seguchi, Tadao; Murakami, Shigeru. Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 41p. (In Japanese). Order Number DE95709890. Source: OSTI; NTIS; INIS.

The nuclear reactor irradiation capsule was developed using a poly(arylen ether nitrile)(BEK) on the bases of the research of BEK by irradiation in the pneumatic tube of JRR-3M. The capsule showed high stability until 150 hours irradiation, which was much longer time compared with the 20 minutes for the capsule made of polyethylene. The radioactivity induced by the reactor irradiation was low as same as polyethylene capsule. This report described the irradiation effects of BEK and the stability of the capsule after nuclear reactor irradiation. (author).

863 (ORNL/M-3789) **FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results.** Siman-Tov, M. (and others); Felde, D.K.; Farquharson, G. Oak Ridge National Lab., TN (United States). Jul 1994. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002303. Source: OSTI; NTIS; INIS; GPO Dep.

The Thermal-Hydraulic Test Loop (THTL) is an experimental facility constructed to support the development of the Advanced Neutron Source Reactor (ANSR) at Oak Ridge National Laboratory (ORNL). Highly subcooled heavy-water coolant flows vertically upward at a very high mass flux of almost 27 MG/m^2-s. In a parallel fuel plate configuration as in the ANSR, the flow is subject to a potential excursive static-flow instability that can very rapidly lead to flow starvation and departure from nucleate boiling (DNB) in the "hot channel". The current correlations and experimental data bases for flow excursion (FE) and critical heat flux (CHF) seldom evaluate the specific combination of ANSR operating parameters. The THTL facility was designed and built to provide known thermal-hydraulic (T/H) conditions for a simulated full-length coolant subchannel of the ANS reactor core, thus facilitating experimental determination of FE and CHF thermal limits under expected ANSR T/H conditions. A series of FE tests with water flowing vertically upward was completed over a nominal heat flux range of 6 to 17 MW/m^2, a mass flux range of 8 to 28 Mg/m^2-s, an exit pressure range of 1.4 to 2.1 MPa, and an inlet temperature range of 40 to 50 C. FE experiments were also conducted using as "soft" a system as possible to secure a true FE phenomena (actual secondary burnout). True DNB experiments under similar conditions were also conducted. To the author's knowledge, no other FE data have been reported in the literature to date that dover such a combination of conditions of high mass flux, high heat flux, and moderately high pressure.

864 (SR/H-751) **Technical Department report on Production Test No. 313-70-M: Behavior of Paul and Beekman cans washed and unwashed.** Eubank, L.D. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 24 Apr 1945. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94015373. Source: OSTI; NTIS; GPO Dep.

Short communication. FUEL CANS/manufacturing; HANFORD PRODUCTION REACTORS; FUEL ELEMENTS; MANUFACTURING; INSPECTION; WASHING; CANNING; TESTING

865 (SR/H–755) **[Technical progress report for Hanford 100 and 300 areas]: Progress report ending May 15, 1943.** Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 19 May 1943. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94015701. Source: OSTI; NTIS; GPO Dep.

This weekly report details technical activities for the week ending May 15, 1943.

866 (SR/H–756) **Technical Division weekly progress report for period ending May 22, 1943.** Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 26 May 1943. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94015702. Source: OSTI; NTIS; GPO Dep.

This report details Technical Division activities for the week ending May 22, 1943.

867 (SR/H–758) **Technical Division weekly progress report for period ending June 5, 1943.** Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant. 8 Jun 1943. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE94015704. Source: OSTI; NTIS; GPO Dep.

This report details Technical Division activities for the week ending June 5, 1943.

868 (SR/H–842) **Report of material and equipment section's activities at New York Shipbuilding Corp. during fabrication of AXC 167 1/2 starting May 18, 1951: Part 9, Section 1 and 2.** Stewart, J.R.; Dills, H.E. Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). 15 Aug 1954. 430p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE95002376. Source: OSTI; NTIS; GPO Dep.

This document details the design and fabrication of the "C" unit plenum chamber. Top and bottom sheet specifications are given especially pertaining to the tubes.

869 (WHC-EP–0804) **Corrosion assessment of dry fuel storage containers.** Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001988. Source: OSTI; NTIS; INIS; GPO Dep.

The structural stability as a function of expected corrosion degradation of 75 dry fuel storage containers located in the 200 Area Low-Level Waste Burial Grounds was evaluated. These containers include 22 concrete burial containers, 13 55-gal (208-l) drums, and 40 Experimental Breeder Reactor II (EBR-II) transport/storage casks. All containers are buried beneath at least 48 in. of soil and a heavy plastic tarp with the exception of 35 of the EBR-II casks which are exposed to atmosphere. A literature review revealed that little general corrosion is expected and pitting corrosion of the carbon steel used as the exterior shell for all containers (with the exception of the concrete containers) will occur at a maximum rate of 3.5 mil/yr. Penetration from pitting of the exterior shell of the 208-l drums and EBR-II casks is calculated to occur after 18 and 71 years of burial, respectively. The internal construction beneath the shell would be expected to preclude containment breach, however, for the drums and casks. The estimates for structural failure of the external shells, large-scale shell deterioration due to corrosion, are considerably longer, 39 and 150 years respectively for the drums and casks. The concrete burial containers are expected to withstand a service life of 50 years.

870 (WHC-SD-FF-SSP–052) **Advanced reactors transition fiscal year 1995 multi-year program plan WBS 7.3.** Loika, E.F. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1994. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001565. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes in detail the work to be accomplished in FY-1995 and the out years for the Advanced Reactors Transition (WBS 7.3). This document describes specific milestones and funding profiles. Based upon the Fiscal Year 1995 Multi-Year Program Plan, DOE will provide authorization to perform the work outlined in the FY 1995 MYPP. Following direction given by the US Department of Energy (DOE) on December 15, 1993, Advanced Reactors Transition (ART), previously known as Advanced Reactors, will provide the planning and perform the necessary activities for placing the Fast Flux Test Facility (FFTF) in a radiologically and industrially safe shutdown condition. The DOE goal is to accomplish the shutdown in approximately five years. The Advanced Reactors Transition Multi-Year Program Plan, and the supporting documents; i.e., the FFTF Shutdown Program Plan and the FFTF Shutdown Project Resource Loaded Schedule (RLS), are defined for the life of the Program. During the transition period to achieve the Shutdown end-state, the facilities and systems will continue to be maintained in a safe and environmentally sound condition. Additionally, facilities that were associated with the Office of Nuclear Energy (NE) Programs, and are no longer required to support the Liquid Metal Reactor Program will be deactivated and transferred to an alternate sponsor or the Decontamination and Decommissioning (D and D) Program for final disposition, as appropriate.

2209 Reactor Safety

Refer also to citation(s) 742, 831, 941, 1150, 1151, 1918

871 (BNL-NUREG–60392) **Issues and approaches in risk-based aging analyses of passive components.** Uryasev, S.P. (Brookhaven National Lab., Upton, NY (United States)); Samanta, P.K.; Vesely, W.E. Brookhaven National Lab., Upton, NY (United States). [1994]. 12p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941142–21: American Society of Mechanical Engineers' winter annual meeting, Chicago, IL (United States), 9-11 Nov 1994). Order Number DE94018671. Source: OSTI; NTIS; INIS; GPO Dep.

In previous NRC-sponsored work a general methodology was developed to quantify the risk contributions from aging components at nuclear plants. The methodology allowed Probabilistic Risk Analyses (PRAs) to be modified to incorporate the age-dependent component failure rates and also aging maintenance models to evaluate and prioritize the aging contributions from active components using the linear aging failure rate model and empirical components aging rates. In the present paper, this methodology is extended to passive components (for example, the pipes, heat exchangers, and the vessel). The analyses of passive components bring in issues different from active components. Here, we specifically focus on three aspects that need to be addressed in risk-based aging prioritization of passive components.

872 (DPW–53-1402-Del.Ver.) **Incidents that require emergency operating procedures.** Brinn, M.S.; Menegus, R.L.; Neill, J.S.; Ring, H.F. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 27 Nov 1953. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–825). Order Number DE95001670. Source: OSTI; NTIS; GPO Dep.

All foreseeable emergencies are adequately forestalled by installing in the reactor areas of the Savannah River Plant a number of pieces of auxiliary equipment. This precaution is taken in order to prevent permanent damage to the main equipment and to contain the radioactive material in the restricted areas of the plant. However, in the unlikely event of failure of some pieces of the main and/or auxiliary equipment, it is necessary that the operators take coordinated emergency action in order to prevent damage and hazard. In some cases swift action is called for. Because there are many pieces of equipment, all of which can conceivably be said to be subject to failure or faulty operation, one could postulate an astronomical number of failure incidents, each one different. But many of these would be highly improbable or call for the same emergency action. On the master incident sheet, Table 1, there are defined twenty such incidents, which represent a fair cross section of the possibilities. In compiling this table, the authors have kept in

mind all of the worst reactor accidents that have occurred in the US and Canada and those minor equipment failures that have occurred at SRP before the startup of the reactors. In addition, there are one or two in the table that are almost impossible to conceive in any reasonable frame of probability; these represent limiting cases insofar as hazard is concerned. The consequences of the incidents mentioned in Table 1 are the results to be expected if the unaffected equipment functions properly, but the operators take no emergency action. For those cases in which damage is to be expected, emergency action by the operators can greatly reduce or eliminate entirely the damage and spread of radioactivity. As a means of showing what actions are necessary and how rapidly they must be accomplished, the twenty incidents considered in this report are analyzed in more detail on the sheets labeled INCIDENT No.

873 (INIS-mf–15054) **Survey of reportable events in nuclear power plants in the Federal Republic of Germany. Period covered: 2nd quarter 1994.** Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany). [1994]. 10p. (In German). Order Number DE95715139. Source: OSTI; NTIS (US Sales Only); INIS.

There were 40 reportable events in the period covered. 39 events belonged to the lowest reporting category N (normal notification, INES scale 0), 1 incident belongs to the category E (immediate notification, INES scale 1). There was no release above limit of radioactivity nor were there any effects on man or environment. (orig.)

874 (NUREG/CP–0138) **Proceedings of workshop I in advanced topics in risk and reliability analysis: Model uncertainty: Its characterization and quantification.** Mosleh, A. (Maryland Univ., College Park, MD (United States)); Smidts, C. (ed.); Siu, N. (ed.); Lui, C. (ed.). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Issue Resolution; Maryland Univ., College Park, MD (United States); EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1994. 242p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). (CONF-9310377–: Advanced topics in risk and reliability analysis, Annapolis, MD (United States), 20 Oct 1993). Source: OSTI; NTIS; INIS; GPO.

The purpose of the workshop series is to provide a forum for in-depth discussion of key problems in risk and reliability analysis, and the development of solution strategies to attack these problems. The workshop topics are selected by an international organizing committee. Special emphasis is placed on risk and reliability problems that are: important, timely, difficult to resolve without further research, and in need of expert input to formulate structured research agendas to assist timely and efficient resolution. The topic of model uncertainty fits all of these criteria. Model uncertainties have been acknowledged as being extremely important in a wide variety of risk assessment application areas, including nuclear power plant risk assessments, radioactive waste repository performance assessments, human health risk assessments, and environmental risk assessments. Clearly, a risk study that neglects to provide a careful treatment of model uncertainties can provide decision makers with a distorted picture of the uncertainties in the study's results. The papers and working group reports contained in these proceedings are divided into three sections. The first section contains papers discussing the appropriate formalism for delaying with model uncertainty. The second section of the proceedings contains papers discussing problems in coping with model uncertainties and approaches for dealing with these problems. The third section of the proceedings contains the summaries of the three working groups. Group 1 deals with the implications of model uncertainty on decision making (including regulatory applications), Group 2 deals with the formal definition of model uncertainty, and Group 3 deals with approaches to quantify model uncertainty.

875 (NUREG/CR–4674-Vol.19) **Precursors to potential severe core damage accidents: 1993, A status report: Volume 19: Main report and appendices A–D.** Vanden Heuvel, L.N. (Oak Ridge National Lab., TN (United States)); Cletcher, J.W.; Copinger, D.A.; Minarick, J.W.; Dolan, B.W. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Programs; Oak Ridge National Lab., TN (United States). Sep 1994. 197p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/NOAC–232-Vol.19). Source: OSTI; NTIS; INIS; GPO.

Sixteen operational events that affected sixteen commercial light-water reactors during 1993 and that are considered to be precursors to potential severe core damage are described. All these events had conditional probabilities of subsequent severe core damage greater than or equal to 1.0×10^{-6}. These events were identified by first computer-screening the 1993 licensee event reports from commercial light-water reactors to identify those that could potentially be precursors. Candidate precursors were then selected and evaluated in a process similar to that used in previous assessments. Selected events underwent engineering evaluated that identified, analyzed, and documented the precursors. Other events designated by the Nuclear Regulatory Commission (NRC) also underwent a similar evaluation. Finally, documented precursors were submitted for review by licensees and NRC headquarters and regional offices to ensure that plant design and its response to the precursor were correctly characterized. This study is a continuation of earlier work, which evaluated 1969–1981 and 1984–1992 events. The report discusses the general rationale for this study, the selection and documentation of events as precursors, and the estimation of conditional probabilities of subsequent severe core damage for events. This document is bound in two volumes: Volume 19 contains the main report and Appendixes A–D; Volume 20 contains Appendixes E and F. Contents include: Selection criteria and quantification and results; Appendix A: Precursors; Appendix B: Containment-related events; Appendix C: "Interesting" events; and Appendix D: Potentially significant events considered impractical to analyze.

876 (NUREG/CR–4674-Vol.20) **Precursors to potential severe core damage accidents: 1993, A status report: Volume 20: Appendices E and F.** Vanden Heuvel, L.N. (Oak Ridge National Lab., TN (United States)); Cletcher, J.W.; Copinger, D.A.; Minarick, J.W.; Dolan, B.W. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Safety Programs; Oak Ridge National Lab., TN (United States). Sep 1994. 391p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/NOAC–232-Vol.20). Source: OSTI; NTIS; INIS; GPO.

Sixteen operational events that affected sixteen commercial light-water reactors during 1993 and that are considered to be precursors to potential severe core damage are described. All these events had conditional probabilities of subsequent severe core damage greater than or equal to 1.0×10^{-6}. These events were identified by first computer-screening the 1993 licensee event reports from commercial light-water reactors to identify those that could potentially be precursors. Candidate precursors were then selected and evaluated in a process similar to that used in previous assessments. Selected events underwent engineering evaluation that identified, analyzed, and documented the precursors. Other events designated by the Nuclear Regulatory Commission (NRC) also underwent a similar evaluation. Finally, documented precursors were submitted for review by licensees and NRC headquarters and regional offices to ensure the plant design and its response to the precursor were correctly characterized. This study is a continuation of earlier work, which evaluated 1969–1981 and 1984–1992 events. The report discusses the general rationale for this study, the selection and documentation of events as precursors, and the estimation of conditional probabilities of subsequent severe core damage for events. This document is bound in two volumes: Volume 19 contains the main report and Appendixes A-D; Volume 20 contains. Appendix E: Resolution of comments on the preliminary 1993 ASP analyses and Appendix F: Licensee event reports and augmented inspection team reports cited in earlier appendices.

877 (NUREG/CR–5535-Vol.6) **RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3.** Shieh, A.S. (EG and G Idaho, Inc., Idaho Falls, ID (United States)); Ransom, V.H.; Krishnamurthy, R. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1994. 149p. Sponsored by Nuclear Regulatory Commission,

Washington, DC (United States). DOE Contract AC07-76ID01570. (EGG–2596-Vol.6). Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO.

The RELAP code has been developed for best-estimate transient simulation of light-water reactor coolant systems during large and small break loss-of-coolant accidents and as well as operational transients. The code models the coupled behavior of the reactor coolant system and the core during a severe accident transient and models large- and small-break loss-of-coolant accidents and operational transients, such as anticipated transient without scram, loss of offsite power, loss of feedwater, and loss of flow. A generic modeling approach is used that permits as much of a particular system to be modeled as necessary. Control system and secondary system components are included to permit modeling of plant controls, turbines, condensers, and secondary feedwater conditioning systems. RELAP5/MOD3 code documentation is divided into five volumes: Volume 1 provides modeling theory and associated numerical schemes; Volume 2 contains detailed instructions for code application and input data preparation; Volume 3 provides the results of developmental assessment cases that demonstrate and verify the models used in the code; Volume IV presents a detailed discussion of RELAP5 models and correlations; Volume V contains guidelines that have evolved over the past several years through use of the RELAP5 code; and Volume 6 contains descriptions of numerical modeling of two-phase flow used in RELAP5 and discussions on stability, accuracy, and convergence of the numerical techniques in RELAP5.

878 (NUREG/CR–6087) **The effects of aging on BWR core isolation cooling systems.** Lee, B.S. (Brookhaven National Lab., Upton, NY (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Brookhaven National Lab., Upton, NY (United States). Oct 1994. 111p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. (BNL-NUREG–52390). Source: OSTI; NTIS; INIS; GPO.

A study was performed to assess the effects of aging on the Reactor Core Isolation Cooling (RCIC) system in commercial Boiling Water Reactors (BWRs). This study is part of the Nuclear Plant Aging Research (NPAR) program sponsored by the US Nuclear Regulatory Commission. The objectives of this program are to provide an understanding of the aging process and how it affects plant safety so that it can be properly managed. This is one of a number of studies performed under the NPAR program which provide a technical basis for the identification and evaluation of degradation caused by age. The failure data from national databases, as well as plant specific data were reviewed and analyzed to understand the effects of aging on the RCIC system. This analysis identified important components that should receive the highest priority in terms of aging management. The aging characterization provided information on the effects of aging on component failure frequency, failure modes, and failures causes. Current inspection, surveillance, and monitoring practices were also reviewed.

879 (NUREG/CR–6161) **Buckling evaluation of System 80+™ containment.** Greimann, L. (Ames Lab., IA (United States)); Fanous, F.; Safar, S.; Challa, R.; Bluhm, D. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Ames Lab., IA (United States). Aug 1994. 130p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-82. (IS–5103). Source: OSTI; NTIS; INIS; GPO.

The System 80+™ containment may be subjected to compressive forces which could cause it to become unstable. The stability of the containment shell under prescribed loading combinations was investigated with two analysis levels: axisymmetric and three dimensional. An axisymmetric shell model, including additional mass to account for penetrations and the spray header system, was analyzed using BOSOR4 and BOSOR5 finite difference codes. Loading combinations with pressure, temperature, self weight, and seismic satisfied the American Society of Mechanical Engineers (ASME) stress allowables. The buckling assessment was performed using the worst meridian assumption, including material nonlinearities and a sinusoidal axisymmetric imperfection. The minimum factor of safety for Service Level C was 2.35. A SSE seismic margin of 2.91 was calculated. The ABAQUS finite element code was selected for the three dimensional analysis and tested with classical and BOSOR solutions. The maximum structural response was computed using response spectrum analysis and six potential buckling regions were identified. A set of equivalent static loads was determined for each of the six regions to regenerate the maximum SRSS stress resultants. For each region, combined loads were increased until an instability was detected. A minimum factor of safety of 1.91 was predicted, which does not satisfy ASME Section NE3222.1 or Regulatory Guide 1.57. Code Case N-284 is satisfied. The analysis is conservative primarily because the SRSS 10% method provides a conservative estimate of modal coupling.

880 (NUREG/CR–6166) **Risk impact of BWR technical specifications requirements during shutdown.** Staple, B.D. (Sandia National Labs., Albuquerque, NM (United States)); Kirk, H.K.; Yakle, J. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Sandia National Labs., Albuquerque, NM (United States); Science Applications International Corp., Albuquerque, NM (United States). Oct 1994. 156p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–93-3998). Source: OSTI; NTIS; INIS; GPO.

This report presents an application of probabilistic models and risk based criteria for determining the risk impact of the Limiting Conditions of Operations (LCOs) in the Technical Specifications (TSs) of a boiling water reactor during shutdown. This analysis studied the risk impact of the current requirements of Allowed Outage Times (AOTs) and Surveillance Test Intervals (STIs) in eight Plant Operational States (POSs) which encompass power operations, shutdown, and refueling. This report also discusses insights concerning TS action statements.

881 (NUREG/CR–6267) **Air-water simulation of phenomena of corium dispersion in direct containment heating.** Ishii, M. (Purdue Univ., Lafayette, IN (United States). School of Nuclear Engineering); Revankar, S.T.; Zhang, G.; Wu, Q.; O'Brien, P. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research; Purdue Univ., Lafayette, IN (United States). School of Nuclear Engineering. Oct 1994. 108p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract FG02-92ER12125. (PU-NE–93/1). Source: OSTI; NTIS; INIS; GPO.

The present research at Purdue addresses the corium dispersion during the direct containment heating in reactor severe accident. The degree of corium dispersion has not only the strongest parametric effect on the containment pressurization but also has the highest uncertainty in predicting it. In view of this, a separate effect test program on the corium dispersion mechanisms in the reactor cavity and the subcompartment trapping mechanisms was initiated in spring of 1992 at Purdue under the direction of the Nuclear Regulatory Commission. Four major objectives of this corium dispersion study are: (1) to perform a detailed scaling study using the newly proposed step-by-step integral scaling method, then to evaluate existing models for entrainment, particle size and trapping, (2) to perform carefully designed simulation experiments using water-air and woods metal-air in a 1/10 linear scale model, (3) to develop reliable mechanistic models and correlations for corium dispersions, which can be used to predict corium jet disintegration, entrainment, drop size, liquid film carry over, and subcompartment trapping, and (4) to use the models to perform stand along calculations for typical prototypic conditions. The combination of water-air and woods metal-air as working fluid will give a unique data base over broad parametric ranges which can be used together with the integral test results to develop reliable models and correlations. The results of the experiments that were conducted using air-water are presented.

882 (ORNL/TM–12701) **Guidance for the design and management of a maintenance plan to assure safety and improve the predictability of a DOE nuclear irradiation facility: Final report.** Booth, R.S. (Oak Ridge National Lab., TN (United States)); Kryter, R.C.; Shepard, R.L.; Smith, O.L.; Upadhyaya, B.R.; Rowan, W.J. Oak Ridge National Lab., TN (United States).

Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001863. Source: OSTI; NTIS; INIS; GPO Dep.

A program is recommended for planning the maintenance of DOE nuclear facilities that will help safety and enhance availability throughout a facility's life cycle. While investigating the requirements for maintenance activities, a major difference was identified between the strategy suitable for a conventional power reactor and one for a research reactor facility: the latter should provide a high degree of predicted availability (referred to hereafter as "predictability") to its users, whereas the former should maximize total energy production. These differing operating goals necessitate different maintenance strategies. A strategy for scheduling research reactor facility operation and shutdown for maintenance must balance safety, reliability,and predicted availability. The approach developed here is based on three major elements: (1) a probabilistic risk analysis of the balance between assured reliability and predictability (presented in Appendix C), (2) an assessment of the safety and operational impact of maintenance activities applied to various components of the facility, and (3) a data base of historical and operational information on the performance and requirements for maintenance of various components. These factors are integrated into a set of guidelines for designing a new highly maintainable facility, for preparing flexible schedules for improved maintenance of existing facilities, and for anticipating the maintenance required to extend the life of an aging facility. Although tailored to research reactor facilities, the methodology has broader applicability and may therefore be used to improved the maintenance of power reactors, particularly in anticipation of peak load demands.

883 (SAND–94-2400C) **Research on U.S. nuclear power plant major equipment aging.** Nakos, J.T.; Rosinski, S.T. Sandia National Labs., Albuquerque, NM (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States). DOE Contract AC04-94AL85000. (CONF-940970–4: 7. international symposium on solar thermal concentrating technologies, Moscow (Russian Federation), 26-30 Sep 1994). Order Number DE95001829. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) and the Electric Power Research Institute (EPRI), in cooperation with nuclear power plant utilities and the Nuclear Energy Institute, have prepared equipment aging evaluations of nuclear power plant equipment for life extension considerations. Specifically, these evaluations focused on equipment considered important for plant license renewal (U.S. Code of Federal Regulations 10CFR54). "Industry Reports" (IRs), jointly funded by DOE and EPRI, evaluated the aging of major systems, structures, and components (e.g., reactor pressure vessels, Class I structures, PWR and BWR containments, etc.) and contain a mixture of technical and licensing information. "Aging Management Guidelines" (AMGs), funded by DOE, evaluate aging for commodity types of equipment (e.g., pumps, electrical switchgear, heat exchangers, etc.) and concentrate on technical issues only. AMGs are intended for systems engineers and plant maintenance staff. A significant number of technical issues were resolved during IR interactions with the U.S. Nuclear Regulatory Commission (NRC). However, certain technical issues have not been resolved and are considered "open". Examples include certain issues related to fatigue, neutron irradiation embrittlement, intergranular stress corrosion cracking (IGSCC) and electrical cable equipment qualification. Direct NRC interaction did not take place during preparation of individual AMGs due to their purely technical nature. The eventual use of AMGs in a future license renewal application will likely require NRC interaction at that time. With a few noted exceptions, the AMG process indicated that current aging management practices of U.S. utilities were effective in preventing age-related degradation. This paper briefly describes the IR and AMG processes and summarizes the unresolved technical issues identified through preparation of the documents.

24 POWER TRANSMISSION AND DISTRIBUTION

2401 Power Systems

884 (SAND–94-8724C) **Electrical simulation and analysis of large complex electrical systems.** Yoon, P. Sandia National Labs., Livermore, CA (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408126–4: 37. midwest symposium on circuits and systems, Lafayette, LA (United States), 2-5 Aug 1994). Order Number DE95003033. Source: OSTI; NTIS; GPO Dep.

Circuit modeling and simulation of large, complex electrical systems presents obstacles related to issues such as circuit partitioning, model validation, model consistency, computational speed, and model management. This paper presents the methodology and processes used by a group at Sandia National Laboratories to resolve these issues in their effort to develop a circuit level simulation model for a large-scale electrical system using the PSPICE™ schematics hierarchical-based circuit simulator.

2402 Power System Networks, Transmission and Distribution

885 (ORNL–6804) **The feasibility of replacing or upgrading utility distribution transformers during routine maintenance.** Barnes, P.R.; Van Dyke, J.W; McConnell, B.W.; Cohn, S.M.; Purucker, S.L. Oak Ridge National Lab., TN (United States). Oct 1994. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002372. Source: OSTI; NTIS; GPO Dep.

It is estimated that electric utilities use about 40 million distribution transformers in supplying electricity to customers in the United States. Although utility distribution transformers collectively have a high average efficiency, they account for approximately 61 billion kWh of the 229 billion kWh of energy lost annually in the delivery of electricity. Distribution transformers are being replaced over time by new, more efficient, lower-loss units during routine utility maintenance of power distribution systems. Maintenance is typically not performed on units in service. However, units removed from service with appreciable remaining life are often refurbished and returned to stock. Distribution transformers may be removed from service for many reasons, including failure, over- or underloading, or line upgrades such as voltage changes or rerouting. When distribution transformers are removed from service, a decision must be made whether to dispose of the transformer and purchase a lower-loss replacement or to refurbish the transformer and return it to stock for future use. This report contains findings and recommendations on replacing utility distribution transformers during routine maintenance, which is required by section 124 of the Energy Policy Act of 1992. The objectives of the study are to evaluate the practicability, cost-effectiveness, and potential energy savings of replacing or upgrading existing transformers during routine utility maintenance and to develop recommendations on ways to achieve the potential energy savings. Using survey data obtained from utilities and analyses of the economics of refurbishment versus replacement of distribution transformers that are removed from service, it is found that on average utilities are implementing reasonable decisions on refurbishment versus replacement.

886 (WHC-SD-FL-ELS–001) **308 Building electrical load list and panel schedules.** Giamberardini, S.J. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1994. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001563. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains two lists. The first lists equipment, load location, source of power, and breaker identification. The second compiles the same information but in a different format, namely, for each power source, the breaker, equipment, and location is given. Building 308 is part of the Fuels and Materials Examination Facility which houses the Secure Automated Fabrication process line for fabrication of reactor fuels and the Breeder Processing Engineering

Test for processing Fast Flux Test Facility fuel to demonstrate closure of the fuel cycle.

2404 Health and Safety

887 (CONF-940671–1) **Effect of a solid insulator on the spark yield of S_2F_{10} in SF_6*.** Sauers, I.; Mahajan, S.M.; Cacheiro, R.A. Oak Ridge National Lab., TN (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From IEEE international symposium on electrical insulation; Pittsburgh, PA (United States); 5-8 Jun 1994. Order Number DE95001422. Source: OSTI; NTIS; GPO Dep.

Because of its toxicity S_2F_{10} production in SF_6 discharges has been the focus of intensive study in recent years. In previous work we have examined the yield of S_2F_{10} for corona, spark and arc discharges and, in sparks, the effects of water and oxygen have been studied systematically. Here we report the influence of an insulating solid spacer on the production of S_2F_{10} in SF_6 when subjected to spark discharges in the energy range 1.6–43 J/spark at a gas pressure of 1 atm. Analyses of the sparked gases were performed using a cryogenic enrichment gas chromatography technique with a sensitivity of less than 10 ppb (parts-per-billion) or 1 in 10^8. With this sensitivity S_2F_{10} can be detected after one or just a few spark(s), minimizing secondary effects of gas contamination, electrode erosion and insulator damage that can influence S_2F_{10} production and make quantitative yield determinations difficult to establish. For these studies Teflon was used as the spacer sandwiched between two stainless steel electrodes. Energy measurements were made after recording the voltage and current waveforms. The amount of S_2F_{10} produced per unit energy deposited into the discharge was found to be greater in the presence of the spacer than for a purely gas gap. Factors which influence S_2F_{10} stability such as surfaces and water will also be discussed.

2407 Economic, Industrial, and Business Aspects

888 (INIS-BR–3428) **Market and own load bulletin - June 1993.** ELETROBRAS, Rio de Janeiro, RJ (Brazil). Jun 1993. 38p. (In Portuguese). Order Number DE95604191. Source: OSTI; NTIS (US Sales Only); INIS.

The electric power consumption in the residential, commercial and industrial Brazilian sectors and in the five Brazilian regions during the month of June 1993 is described. The industrial production indexes, the cost of tariffs and fuel consumption and the evolution of own load energy and the energy demand are also shown. (C.G.C.).

889 (INIS-BR–3429) **Market and own load bulletin - July 1993.** ELETROBRAS, Rio de Janeiro, RJ (Brazil). Jul 1993. 38p. (In Portuguese). Order Number DE95604192. Source: OSTI; NTIS (US Sales Only); INIS.

The electric power consumption in the residential, commercial and industrial Brazilian sectors and in the five Brazilian regions during the month of July 1993 is described. The industrial production indexes, the cost of tariffs and fuel consumption and the evolution of own load energy and the energy demand are also shown. (C.G.C.).

890 (INIS-BR–3430) **Market and own load bulletin - August 1993.** ELETROBRAS, Rio de Janeiro, RJ (Brazil). Aug 1993. 42p. (In Portuguese). Order Number DE95604193. Source: OSTI; NTIS (US Sales Only); INIS.

The electric power consumption in the residential, commercial and industrial Brazilian sectors and in the five Brazilian regions during the month of August 1993 is described. The industrial production indexes, the cost of tariffs and fuel consumption and the evolution of own load energy and the energy demand are also shown. (C.G.C.).

891 (INIS-mf–14367) **Electricity demand forecasting techniques.** Gnanalingam, K. Ceylon Electricity Board, Colombo (Sri Lanka). 1994. 17p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604194. Source: OSTI; NTIS (US Sales Only); INIS.

Electricity demand forecasting plays an important role in power generation. The two areas of data that have to be forecasted in a power system are peak demand which determines the capacity (MW) of the plant required and annual energy demand (GWH). Methods used in electricity demand forecasting include time trend analysis and econometric methods. In forecasting, identification of manpower demand, identification of key planning factors, decision on planning horizon, differentiation between prediction and projection (i.e. development of different scenarios) and choosing from different forecasting techniques are important.

892 (INIS-mf–14371) **Electricity pricing.** Wijayatunga, P.D.C. Moratuwa Univ. (Sri Lanka). Dept. of Electrical Engineering. 1994. 16p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604195. Source: OSTI; NTIS (US Sales Only); INIS.

Electricity pricing in most countries, especially in the developing world, has been determined by traditional accounting criteria where it raises revenue requirements to cover the operating costs and a return on past and future capital investments in possible power systems. The use of economic principles to improve the total economic efficiency in the electricity industry is discussed. Basic marginal cost theory, long run marginal costing (LRMC) cost categories and rating periods, marginal capacity costs, marginal energy costs, consumer costs, short run marginal costing (SRMC), marginal cost of fuel, marginal cost of network losses, market clearing price, value of unserved energy and network quality of supply cost are discussed.

25 ENERGY STORAGE

2501 Magnetic

Refer also to citation(s) 1074

2502 Compressed and Liquefied Gas

Refer also to citation(s) 901

2506 Thermal

893 (ETDE/DE-mf–95708677) **IEA Implementing Agreement: energy conservation through energy storage. Annex 5: Full scale latent heat storage installations. Final report.** Lottner, V. (ed.). Forschungszentrum Juelich GmbH (Germany). Sep 1992. 92p. Sponsored by International Energy Agency (IEA), 75 - Paris (France);Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328829A; Foerderkennzeichen BMFT 032882 Order Number DE95708677. Source: OSTI; NTIS (US Sales Only).

The objective of this Task is to prove the technical and economic feasibility of latent heat storage technology in field applications. Installation and monitoring will be performed in various operational and field test systems. Information shall be obtained from which the performance, energy saving and economic value of the storage systems can be determined. Task V comprises both latent heat and cool storage technologies. Recently, ice storage systems have been installed in many plants in Europe, too. By using cool stores, the electric peak power demand of chillers in air-conditioning systems of commercial buildings can be reduced substantially. Cool stores are an effective means for energy demand side management. For this reason they are being favoured by electric utilities, too. (orig./UA)

894 (NEDO-NP–9320) **Possibility of introducing heat storage technologies to Hokkaido.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 124p. (In Japanese). Order Number DE95714820. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In Hokkaido, there is a considerable difference in energy consumption between both summer and winter seasons. To harmonize

it, a system was studied which stored, for a long period, the solar energy and surplus heat energy not utilized in summer so as to be done in winter. The long-term heat storage is, as a method, underground heat storage in buried water tanks, aquifer heat storage in natural underground aquifers, chemical heat storage by chemical reactions and solar pond heat storage in bottom layer of the pond. Based on precedent development examples, the aquifer heat storage was known to be effective in Hokkaido. Cogeneration heat in the plant, and exhaust heat from the thermal power station and urban waste incinerator were proposed as a thermal source to be utilized together with utilization of hot water pump and heat pipe to draw the heat from the aquifers. On the demanding side, utilization is made by heat pump for the air heating and hot water supply. Promising regions for the utilization are urban areas and adjacent ones to them. For the materialization, a large-scale heat pump should be developed through a feasibility study of using it. 17 refs., 54 figs., 19 tabs.

2509 Batteries

Refer also to citation(s) 726, 1674

895 (BNL–60533) **Composition and cycle life of multicomponent AB_5 hydride electrodes.** Adzic, G.D. (Brookhaven National Lab., Upton, NY (United States)); Johnson, J.R.; Reilly, J.J.; McBreen, J.; Mukerjee, S.; Kumar, M.P.S.; Zhang, W.; Srinivasan, S. Brookhaven National Lab., Upton, NY (United States); Texas A and M Univ., College Station, TX (United States). Center for Electrochemical Systems and Hydrogen Research. [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; FG03-93ER14381. (CONF-941063–10: 186. meeting of the Electrochemical Society, Miami, FL (United States), 9-14 Oct 1994). Order Number DE95002172. Source: OSTI; NTIS; GPO Dep.

Multicomponent AB_5 hydrides are attractive replacements for the cadmium electrode in nickel – cadmium batteries. The archetype compound of the AB_5 alloy class is $LaNi_5$, but in a typical battery electrode mischmetal is substituted for La and Ni is substituted in part by variety of metals. While the effects of Ni substitution have been widely studied, relatively little effort has focused on the effect of La substitution. This paper deals with the effect on cycle life due to the increasing presence of Ce in the alloy series $La_{1-x}Ce_xNi_{3.55}Co_{.75}Mn_{.4}Al_{.3}$. Alloys were characterized by the determination of pressure-composition relationships, molar volume of H and electrode cycle life. The effects due to lattice expansion are taken into account. It was concluded that the rate of loss of electrochemical capacity per charge/discharge cycle was significantly decreased due to the presence of Ce.

896 (LBL–35566) **Exploratory Technology Research Program for electrochemical energy storage: Executive summary report for 1993.** Kinoshita, K. (ed.). Lawrence Berkeley Lab., CA (United States). Sep 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002651. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's Office of Propulsion Systems provides support for an Electrochemical Energy Storage Program, that includes research and development (R&D) on advanced rechargeable batteries and fuel cells. A major goal of this program is to develop electrochemical power sources suitable for application in electric vehicles (EVs). The program centers on advanced systems that offer the potential for high performance and low life-cycle costs, both of which are necessary to permit significant penetration into commercial markets. The DOE Electrochemical Energy Storage Program is divided into two projects: the Electric Vehicle Advanced Battery Systems (EVABS) Development Program and the Exploratory Technology Research (ETR) Program. The EVABS Program management responsibility has been assigned to Sandia National Laboratories (SNL); Lawrence Berkeley Laboratory (LBL) is responsible for management of the FIR Program. The EVABS and ETR Programs include an integrated matrix of R&D efforts designed to advance progress on selected candidate electrochemical systems. The United States Advanced Battery Consortium (USABC), a tripartite undertaking between DOE, the U.S. automobile manufacturers and the Electric Power Research Institute (EPRI), was formed in 1991 to accelerate the development of advanced batteries for consumer EVs. The role of the FIR Program is to perform supporting research on the advanced battery systems under development by the USABC and EVABS Program, and to evaluate new systems with potentially superior performance, durability and/or cost characteristics. The specific goal of the ETR Program is to identify the most promising electrochemical technologies and transfer them to the USABC, the battery industry and/or the EVABS Program for further development and scale-up. This report summarizes the research, financial and management activities relevant to the ETR Program in CY 1993.

897 (LBL–35567) **Exploratory Technology Research Program for electrochemical energy storage: Annual report for 1993.** Kinoshita, K. (ed.). Lawrence Berkeley Lab., CA (United States). Sep 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002652. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's Office of Propulsion Systems provides support for an Electrochemical Energy Storage Program, that includes research and development (R&D) on advanced rechargeable batteries and fuel cells. A major goal of this program is to develop electrochemical power sources suitable for application in electric vehicles (EVs). The program centers on advanced systems that offer the potential for high performance and low life-cycle costs, both of which are necessary to permit significant penetration into commercial markets. The DOE Electrochemical Energy Storage Program is divided into two projects: the Electric Vehicle Advanced Battery Systems (EVABS) Development Program and the Exploratory Technology Research (ETR) Program. The EVABS Program management responsibility has been assigned to Sandia National Laboratories (SNL); Lawrence Berkeley Laboratory (LBL) is responsible for management of the ETR Program. The EVABS and ETR Programs include an integrated matrix of R&D efforts designed to advance progress on selected candidate electrochemical systems. The United States Advanced Battery Consortium (USABC), a tripartite undertaking between DOE, the U.S. automobile manufacturers and the Electric Power Research Institute (EPRI), was formed in 1991 to accelerate the development of advanced batteries for consumer EVs. The role of the FIR Program is to perform supporting research on the advanced battery systems under development by the USABC and EVABS Program, and to evaluate new systems with potentially superior performance, durability and/or cost characteristics. The specific goal of the ETR Program is to identify the most promising electrochemical technologies and transfer them to the USABC, the battery industry and/or the EVABS Program for further development and scale-up. This report summarizes the research, financial and management activities relevant to the ETR Program in CY 1993.

898 (LBL–35628) **Nickel hydroxide electrodes in reduced-alkalinity electrolytes.** Plivelich, R.F. Lawrence Berkeley Lab., CA (United States). Apr 1994. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002333. Source: OSTI; NTIS; GPO Dep.

Ni oxide electrodes cycled to failure in zinc-nickel oxide cells were studied; these cells incorporated novel electrolytes intended to increase the Zn electrode cycle life. The Zn species deposited in the failed Ni electrodes was probably $Zn(OH)_2$ or ZnO. Evidence was found for a strictly mechanical interpretation of the capacity degradation of the Ni oxide electrodes. The gas evolution in failure of Ni electrodes in the zinc-Ni oxide system using a reduced-alkalinity electrolyte, needs to be studied.

899 (SAND–94-1398C) **Thin flexible intercalation anodes.** Levy, S.C.; Cieslak, W.R.; Klassen, S.E.; Lagasse, R.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941063–8: 186. meeting of the Electrochemical Society, Miami, FL (United States), 9-14 Oct 1994). Order Number DE95001603. Source: OSTI; NTIS; GPO Dep.

Poly(acrylonitrile) fibers have been pyrolyzed under various conditions to form flexible carbon yarns capable of intercalating lithium ions. These fibers have also been formed into both woven and non woven cloths. Potentiostatic, potentiodynamic and galvanostatic

tests have been conducted with these materials in several electrolytes. In some tests, a potential hold was used after each constant current charge and discharge. These tests have shown some of these flexible materials to reversibly intercalate lithium ions to levels that are suitable for use as a practical battery anode.

900 (SAND–94-2047) **Zinc/air technology, December 1993 meeting report.** Clark, C. (Sandia National Labs., Albuquerque, NM (United States)); Kinoshita, K. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002958. Source: OSTI; NTIS; GPO Dep.

A Zinc/Air Battery Review and Strategic Planning Meeting was held in 1993. One outcome of the meeting was recognition of the need for a report on the current status of the technology. This report contains contributions from many of the attendees at the above meeting and expresses their views on where the technology is today and what could/should be done to improve its performance.

2520 Health and Safety

901 (ETDE/DE-mf–95716363) **Release of propane under practice-oriented conditions - calculation of concentrations of gases with and without obstacles.** Heinrich, M.; Scherwinski, R. Technischer Ueberwachungs-Verein Nord e.V., Hamburg (Germany). Abt. Umweltschutz. Mar 1991. 98p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 13RG8807. Order Number DE95716363. Source: OSTI; NTIS (US Sales Only).

During the production, transport, storage and consumption of liquefied gases (for example propane, butane, vinyl chloride) one cannot rule out the possibility that conduits, fittings, pumps, heat exchangers etc. are damaged, leading to a release of somewhere between 1 and several units of 10 kg/sec. The calculation of the dispersion of heavy gases which are released as a result within the framework of the security analysis of the accident regulations is carried out according to the Association of German Engineers' Guideline 3783 Page 2, which was published in July of 1990. It was possible to pass these guidelines after the wind-channel tests on which the guidelines were based were confirmed by field tests in a previous research project (Practice-oriented Determination of Ignition Distances) during the Release of Heavy Gases, sponsored under Reference-no. 01RG8402 by the Federal Ministry of Research and Technology. (orig.)

29 ENERGY PLANNING AND POLICY

902 (ETDE/DE-mf–95708791) **The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991.** Meesmann, H. (comp.). Industrie- und Handelskammer, Luebeck (Germany). 1992. 235p. (In German). Order Number DE95708791. Source: OSTI; NTIS (US Sales Only).

Looking at the energy economy of the countries around the Baltic Sea one realises that conditions differ greatly from one country to the next. Environmentally friendly hydropower plays a great role in Norway which exports a lot of energy anyway. The young Baltic states, however still have energy deficits because relations with the former suppliers are disrupted. All countries surrounding the Baltic Sea, however have a common target: energy saving. A respectalbe measure of success has already been achieved and the environment has profited from it. Economically, the Baltic Sea region is growing together more and more as markets establish closer links, but there is still a deficit of multilateral cooperation of the energy economies. New initiatives are being taken, however, and it is not too hard to imagine that energy networks will unite the Baltic Sea states in the future. (orig./US)

903 (ETDE/DE-mf–95711726) **East German energy supply in transition: From a planned economy to a market economy.** Rheinisch-Westfaelisches Elektrizitaetswerk AG, Essen (Germany). Energiewirtschaftlicher Arbeitskreis. Oct 1993. 40p. (In German). Order Number DE95711726. Source: OSTI; NTIS (US Sales Only).

After outlining the situation as it was when Germany was reunited, the brochure goes into detail about the situation of the various energy sources, i.e. brown coal, mineral oil, natural gas and town gas, electricity, district heating, and renewable energy sources. The consolidating effect of private investments is pointed out. (UA)

904 (NEDO-P–9453) **Project for exchange of researchers concerned in petroleum substitution energy with EC countries.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 45p. (In Japanese). Order Number DE95714833. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

As part of collecting information on petroleum substitution energy/energy conservation, two specialists were invited from EC countries where its research and development are conducted hard. Exchange of information on the technical development trend was made, and exchange of opinion on definite research cooperation was made at the same time. At the Energy Measurement Analysis Center of the Institute of Energy Economics, discussions were made on Japan's energy supply and demand, rise in use of natural gas and nuclear power, suppression of CO2 emission at the 1990 level, and decreasing dependence on petroleum. At Agency of Natural Resources and Energy, discussions were made on coal liquefaction and gasification, especially the liquefaction plant for Australian brown coal, and the liquefaction plant for Japanese bituminous coal. At Agency of Industrial Science and Technology, widely discussed were coal liquefaction and gasification, the other coal related technologies, photovoltaic power generation, ceramics/gas turbine, and geothermal power generation. Energy-related discussions were also at the Energy Conservation Center, NEDO, New Energy Foundation, and companies' laboratories.

2901 Energy Analysis and Modeling

Refer also to citation(s) 910

905 (ETDE/DE-mf–95708767) **The Schleswig-Holstein energy model.** Die neue Energiepolitik, v. 13. Ministerium fuer Arbeit und Soziales, Jugend, Gesundheit und Energie des Landes Schleswig-Holstein, Kiel (Germany). Dec 1992. 35p. (In German). Order Number DE95708767. Source: OSTI; NTIS (US Sales Only).

The Schleswig-Holstein energy model provides the basis for the development of a new, environmentally compatible energy system which contributes to the conservation of resources. The model is implemented through cooperation of the Land Government, the Schleswig-Holstein communities, trade and industry, public and people. The Schleswig- Holstein energy model demonstrates that considerable reductions in carbon dioxide emissions can be achieved without the assistance of nuclear energy. Major contributions to the minimization of carbon dioxide emissions are expected from private household space heating and from an increased utilization of renewable energy sources. The development of a new, environmentally compatible energy system which contributes to the conservation of resources is an ecological challenge and a challenge to the Schleswig- Holstein industry. (orig./UA)

2902 Economics and Sociology

Refer also to citation(s) 796, 799, 919, 926, 985, 993, 1000, 1001, 1060

906 (CONF-9110540–Summ.) **Workshop on establishing institutional credibility for SEAB Task Force on Radioactive Waste Management.** National Academy of Sciences - National Research Council, Washington, DC (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-91ER35127. From Workshop on establishing institutional credibility for SEAB task force on radioactive waste management; Denver, CO (United States); 24-25 Oct 1991. Order Number DE95001012. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the Secretary of Energy Advisory Board's Task Force on Civilian Radioactive Waste Management, the National

Research Council sponsored a workshop on Establishing Institutional Credibility. The purpose of the workshop was to (1) identify the range of available knowledge regarding the theoretical and conceptual issues of how institutions establish their credibility and legitimacy with key constituents, and (2) to help explore and clarify fundamental concepts in management theory related to these issues. The examination was to include what is known about how organizations establish, maintain, lose, and regain public trust and confidence. There was to be no attempt to develop consensus on these issues or to suggest particular courses of action. The workshop was held on October 24-25, 1991, in Denver, Colorado.

907 (CONF-9308217–, pp. 8, Paper 14) **Economics, funding and the influence of politics on the Wismut Program.** Mager, D. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This presentation gives an overview of the interactions among legal aspects, financial aspects, political reorganization of East Germany, and political issues in reference to remedial action on the Wismut Uranium mine program in Germany.

908 (CONF-9308217–, pp. 34, Paper 13) **Economics, funding and the influence of politics on the UMTRA Project.** Hamp, S. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This presentation discusses the factors contributing to the cost of the Uranium Mill Tailings Remediation Action Project and the political process involved in the funding. Topics covered include the following: Funding estimate and growth of estimate; Management actions during process; how the political process worked; cost of completed sites; economic benefit analysis of the project to Colorado; cost reduction program for the UMTRA project

909 (INIS-mf–14368) **Introduction to the national energy situation.** Perera, K.K.Y.W. No corporate text available. 1994. 24p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604117. Source: OSTI; NTIS (US Sales Only); INIS.

For improvement of the quality of people economic development is a key factor. To enhance the quality of life, availability of energy is vital. Principle sources of gross energy supply are biomass, petroleum, hydroelectricity. Biomass is responsible for 70.9% of energy supply. The energy consumption is shared by household, industry, transport. Commercial with household consumption is responsible for nearly 69% of the total. The use of electricity for industrial purposes has diminished from 50% in 1977 to 36% in 1989 whereas domestic share has doubled during the same period. Fuel wood supply will also contribute to energy demand and supply will increase gradually. Reduction of imports such as oil will help to maintain the balance of payment, as Sri Lanka Rupee had been gradually slipping down in relation to the US dollar, the Sterling Pound. Effective use of fuel wood and biomass will reduce consumption of oil.

910 (INIS-mf–15039) **Assessing energy projects from the viewpoint of individual economic branches and total economy: The role of economic efficiency analysis, cost-benefit analysis and multicriteria methods.** Berichte aus dem Weltwirtschaftlichen Colloquium der Universitaet Bremen, v. 28. Sell, A. Bremen Univ. (Germany). Inst. fuer Weltwirtschaft und Internationales Management (IWIM). Sep 1992. 20p. (In German). (CONF-9209481–: Small energy projects in developing countries - identification, evaluation and planning of projects meeting, Bremen (Germany), 24-25 Sep 1992). Order Number DE95711767. Source: OSTI; NTIS (US Sales Only); INIS.

Energy is an extremely important good and means of production not only for the individual branches of economy but, due to its essential meaning to the development of a region or a national economy and its external effects connected with production and consumption, also of great interest to all economic branches. This article deals with the relation of analyses in individual economical branches and those in total economy and with the question of what the importance of cost-benefit analyses and other methods is in the analysis in total economy. The author also mentions the planning as in the special literature the planning and evaluation phases are not analytically separated which is seen especially in the discussion about the multi-criteria methods. (orig.)

911 (RFP-ADD–0030) **A research study to determine the effect of Total Quality Management (TQM) on employee morale in Plant Procedures Division at EG&G, Rocky Flats, Inc.** Casey, E.F. EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant. Jan 1994. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC34-90DP62349. Order Number DE94010792. Source: OSTI; NTIS; GPO Dep.

Thesis submitted to the University of Phoenix, Arizona.

EG&G at Rocky Flats, Golden, Colorado, experienced a high amount of low morale, due to the plant site having been designated to close, and the uneasiness of the working force was very visible. Some employees accepted early retirement in October 1992, however, all received letters of 120 days notice in March 1993, and were advised several cuts Would be made by October 1, 1993. This information alone caused many insecurities in employees, and caused morale to decrease even more. This is an in depth study of morale, which was upgraded in Plant Procedures Group (PPG), through the effect of TQM. The primary research included a survey of employees with results included. The study also increased additional questions in PPG, some of which were added to the agenda of the Process Improvement Team (PIT) to improve PPG in the eyes of customers. Statistics did show that morale improved, not necessarily because of TQM or the progress of the Process Improvement Team (PIT), but due to efforts of the staff implementing the principles of TQM the best they knew how.

2903 Environment, Health, and Safety

Refer also to citation(s) 150, 236, 246, 298, 405, 473, 483, 485, 515, 874, 965, 1035, 1094, 1782, 1910, 2513

912 (CONF-9308217–, pp. 24, Paper 8) **Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness.** Goldammer, W. (Brenk Systemplanung, Aachen (Germany)). Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This paper compares the use of risk analysis with the use of prescribed environmental standards to protect human health and the environment and meet a level of acceptable risk. A general comparison is presented, followed by a discussion of site factors and a specific example of targets for ground water remediation in in-situ leach mine. Conclusions drawn include: Perscriptive standards facilitate planning implementation and regulatory processes; risk based approaches allow for an optimal utilization of financial resources without being less protective; Perscriptive standards are beneficial if reclaimation projects in question do not differ too much with respect to site conditions; If site conditions are highly variable or long term restrictions on use of water resources or land use are necessary, risk based approaches are more appropriate.

913 (DOE/EH–0001) **RCRA corrective action & CERCLA remedial action reference guide.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Guidance. Jul 1994. 17p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002644. Source: OSTI; NTIS; INIS; GPO Dep.

This reference guide provides a side-by-side comparison of RCRA corrective action and CERCLA Remedial Action, focusing on the statutory and regulatory requirements under each program, criterial and other factors that govern a site's progress, and the ways in which authorities or requirements under each program overlap and/or differ. Topics include the following: Intent of regulation; administration; types of sites and/or facilities; definition of site and/or facility; constituents of concern; exclusions; provisions for short-term remedies; triggers for initial site investigation; short term response actions; site investigations; remedial investigations; remedial alternatives; clean up criterial; final remedy; implementing remedy; on-site waste management; completion of remedial process.

914 (DOE/EH–23-0002(b)) **CERCLA site assessment workbook.** Geological Survey, Salt Lake City, UT (United States). Aug 1994. 93p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002645. Source: OSTI; NTIS; INIS; GPO Dep.

This contains comments for each chapter of exercises (in Vol. 1) which illustrate how to conduct site assessments for CERCLA regulation. A through analysis of the exercises is provided so that work and solutions from Vol 1 can be critiqued and comments are also included on the strategy of site assessment whereas the exercises illustrate the principles involved. Covered exercises include the following: A preliminary assessment of a ground water site; waste characteristics and characterization of sources; documentation of observed releases and actual contamination of targets; the strategy of an SI at a surface water site; the soil exposure pathway; the air pathway.

915 (DOE/EH–0421) **Special issue review of pollution prevention management within the Department of Energy, final report.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Office of Environmental Audit. Aug 1994. 51p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002535. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE) national role and overall mission has been undergoing significant change. In the post-Cold War era, a new emphasis on cleaning up the wastes from the past has emerged. These changes provide both significant challenges as well as new opportunities for DOE. While the challenges may seem overwhelming as DOE realizes the magnitude of its environmental problems, its network of national laboratories and sites provide the resources to become a leader in environmental management through the development of new technologies and management practices. Because of the growing importance of pollution prevention in the United States and more specifically to DOE's environmental management strategy, the Office of Environmental Audit (EH-24) identified this as an area worthy of a Special Issue Review. A Special Issue Review is not an audit but rather an in-depth review of key environmental programs or activities which cut across organizational boundaries. The purpose of a Special Issue Review is to identify strengths and weaknesses of a program as well as significant crosscutting issues or challenges that are important to the future success of that program. The scope of the review included an assessment of pollution prevention program activities at Headquarters, selected operations offices, and selected sites offices and contractor organizations. All aspects of a pollution prevention program were considered including program strategy, infrastructure, management systems, and implementation practices. Also summarized are future pollution prevention challenges and recommendations.

916 (DOE/EW/50625–T19) **Environmental Hazards Assessment Program: Quarterly report, July 1994–September 1994.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Oct 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE95002577. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of the Environmental Hazards Assessment Program (EHAP) stated in the proposal to DOE are as follows: Development of a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; development of a pool of talented scientist and experts in cleanup activities, especially in human health aspects; identification of needs and development of programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health oriented aspects of environmental restoration and waste management. This is a progress report of the first quarter of the third year of the grant. It reports progress against these grant objectives and the Program Implementation Plan (published at the end of the first year of the grant).

917 (ETDE/DE-mf–95716184) **Levies as instruments of environment protection: aspects of water and energy economy.** Arbeitspapier des Schwerpunktes Finanzwissenschaft/Betriebswirtschaftslehre Steuerlehre Universitaet Trier, v. 29. Baurichter, F.; Hoffmann, V. Trier Univ. (Germany). Fachbereich 4 - Wirtschafts- und Sozialwissenschaften/Mathematik/Informatik. Jun 1993. 31p. (In German). Order Number DE95716184. Source: OSTI; NTIS (US Sales Only).

Diverse governmental control measures of environment protection are already in effect. Further regulations, particularly in the area of fiscal charges, are in the stage of parliamentary preparation or are a topic of lively and controversial public discussion. Laymen find it difficult to recognise an order and make distinctions in these matters. They are unable to weigh the pros and cons of proposed solutions. A critical analysis of the relationships involved soon shows that generalised valuations can lead to wrong decisions with grave environment-economic consequences. The two lectures contained in this contribution deal with the following two aspects: water economy and water penny; and energy economy and CO_2/energy taxation. (orig./UA)

918 (INIS-mf–14345, pp. 29-30) **The Ikarus project.** Hake, J.F. (System Analysis and Technology Evaluation, Research Center Juelich GmbH, Juelich (Germany)); Walbeck, M.; Martinsen, D.; Markewitz, P.; Kuckshinrichs, W. Ministry of Science and Technology, Jerusalem (Israel). Feb 1994. 120p. (CONF-9402106–: SOLCOM I 1994: International conference on comparative assessments of solar power technologies, Jerusalem (Israel), 14-18 Feb 1994; NCRD–94-1.). In *International conference on comparative assessments of solar power technologies.* Order Number DE95602439. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. AIR POLLUTION/global aspects; COMPUTERIZED SIMULATION; EMISSION; GREENHOUSE GASES

919 (INIS-mf–15041) **Do we need a tax on energy or CO_2?.** Stromdiskussion, v. 183. Informationszentrale der Elektrizitaetswirtschaft e.V. (IZE), Frankfurt am Main (Germany). Jul 1992. 4p. (In German). Order Number DE95711742. Source: OSTI; NTIS (US Sales Only); INIS.

Taxes for energy consumption and CO_2 production are a much-discussed issue. The pros and cons are reviewed in two contributions in order to help the reader to make up his own mind. (DG)

920 (INIS-mf–15043) **CO_2 burden and climatic risk: Strategies of action of the German electricity supply companies.** Strombasiswissen, v. 104. Informationszentrale der Elektrizitaetswirtschaft e.V. (IZE), Frankfurt am Main (Germany). Jun 1992. 8p. (In German). Order Number DE95711743. Source: OSTI; NTIS (US Sales Only); INIS.

According to indications of the working group for questions on the climate of the association of German electric utilities (VDEW), energy application of power generation contributes to the German CO_2-emission with about 30%. A reduction of CO_2-emissions in electro-economics can be achieved especially with a decrease of the application of fossil energy sources parallel to a better energy utilization (increase of the efficiency, enlargement of cogeneration) and through the expansion of power generation free from CO_2 (nuclear energy, renewable energy sources). (orig.)

921 (LBL–27170(1994)) **Lawrence Berkeley Laboratory 1993 Site Environmental Report.** Lawrence Berkeley Lab., CA (United States). May 1994. 216p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94018546. Source: OSTI; NTIS; GPO Dep.

This annual Site Environmental Report summarizes Lawrence Berkeley Laboratory's (LBL's) environmental activities in calendar year (CY) 1993. The purpose of this report is to characterize site environmental management performance, confirm compliance status with environmental standards and requirements, and highlight significant programs and efforts. Its format and content are consistent with the requirements of the US Department of Energy (DOE) Order 5400.1, General Environmental Protection Program.

922 (PNL-SA–24404) **Integrated demonstrations, integrated programs, and special programs within DOE's Office of Technology Development.** Peterson, M.E.; Frank, C.; Stein, S.; Steele, J. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815–86: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017456. Source: OSTI; NTIS; INIS; GPO Dep.

This poster session presents information on integrated demonstrations, integrated programs, and special programs within the EM Office of Technology Development that will accelerate cleanup of sites within the Nuclear Weapons Complex. Presented topics include: Volatile organic compounds in soils and ground water, uranium in soils, underground storage tanks, mixed waste landfills, decontamination and decommissioning, in situ remediation, and separations technology.

2904 Energy Resources

Refer also to citation(s) 983

923 (DOE/EIA–0035(94/10)) **Monthly energy review, October 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. 26 Oct 1994. 196p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002062. Source: OSTI; NTIS; GPO; GPO Dep.

Energy production during July 1994 totaled 5.5 quadrillion Btu, a 2.8-percent increase from the level of production during July 1993. Coal production increased 8.3 percent, natural gas production rose 2.8 percent, and petroleum production decreased 1.9 percent. All other forms of energy production combined were up 1.1 percent from the level of production during July 1993. Energy consumption during July 1994 totaled 7.1 quadrillion Btu, 0.8 percent above the level of consumption during July 1993. Natural gas consumption increased 3.2 percent, petroleum consumption rose 0.7 percent, and coal consumption was down 1.6 percent. Consumption of all other forms of energy combined increased 2.4 percent from the level 1 year earlier. Net imports of energy during July 1994 totaled 1.7 quadrillion Btu, 11.3 percent above the level of net imports 1 year earlier. Net imports of petroleum increased 8.4 percent, and net imports of natural gas were up 8.4 percent. Net exports of coal fell 14.6 percent from the level in July 1993. This report is divided into: Energy overview; energy consumption; petroleum; natural gas; oil and gas resource development; coal; electricity; nuclear energy; energy prices; international energy; appendices (conversion factors); and glossary.

2905 Research, Development, Demonstration, and Commercialization

Refer also to citation(s) 42, 43, 112, 642, 696, 701, 707, 711, 896, 897, 993, 1000, 1001, 1009, 1028, 1035, 1041, 1077, 1173, 1448, 2457, 2536

924 (ANL/ET/RP–83893) **Energy Technology Division research summary – 1994.** Argonne National Lab., IL (United States). Energy Technology Div. Sep 1994. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001449. Source: OSTI; NTIS; INIS; GPO Dep.

Research funded primarily by the NRC is directed toward assessing the roles of cyclic fatigue, intergranular stress corrosion cracking, and irradiation-assisted stress corrosion cracking on failures in light water reactor (LWR) piping systems, pressure vessels, and various core components. In support of the fast reactor program, the Division has responsibility for fuel-performance modeling and irradiation testing. The Division has major responsibilities in several design areas of the proposed International Thermonuclear Experimental Reactor (ITER). The Division supports the DOE in ensuring safe shipment of nuclear materials by providing extensive review of the Safety Analysis Reports for Packaging (SARPs). Finally, in the nuclear area they are investigating the safe disposal of spent fuel and waste. In work funded by DOE's Energy Efficiency and Renewable Energy, the high-temperature superconductivity program continues to be a major focal point for industrial interactions. Coatings and lubricants developed in the division's Tribology Section are intended for use in transportation systems of the future. Continuous fiber ceramic composites are being developed for high-performance heat engines. Nondestructive testing techniques are being developed to evaluate fiber distribution and to detect flaws. A wide variety of coatings for corrosion protection of metal alloys are being studied. These can increase lifetimes significant in a wide variety of coal combustion and gasification environments.

925 (DOE/CR–0028) **Chief Financial Officer FY 1994, status report and five-year plan.** Department of Energy, Washington, DC (United States). Office of the Controller. Sep 1994. 95p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002534. Source: OSTI; NTIS; GPO Dep.

The Chief Financial Officers Act of 1990 (CFO Act) establishes the legal framework for improved Federal financial management. The act provides senior Government officials with clear responsibilities and requirements in key financial management areas, including leadership, organization, and reporting. The act also requires the agency CFO to prepare, and annually revise, a plan to implement the Office of Management and Budget (OMB) Federal Financial Management Status Report and Five-Year Plan. This is the third Status Report and Five-Year Plan submission to OMB by the Department of Energy (DOE). This report sets forth the Department's plans for financial management improvements in the coming years and highlights several new, important initiatives completed or currently under way that will significantly improve the overall effectiveness of the financial management processes. Other initiatives that are under way are also detailed in this report. The Bonneville Power Administration (BPA) will submit a separate FY 1994 Status Report and Five-Year Plan; therefore, accomplishments and plans for financial management improvements for BPA are excluded from this report. This report is broken into two main parts: (1) the introductory material, which consists of this Executive Summary; an introduction to the history and mission of the Department; the CFO's vision for financial management within the Department and the Federal Government as a whole; and a description of the Department's financial management organization, mission, and plans and (2) the main body of the report, which is divided into the following chapters: Financial Stewardship, Full Partnership, Customer Orientation, Human Resources Management, and Technology/Information Architecture. These chapters correspond to the strategic thrust areas of the Department's Financial Management Strategic Plan.

926 (DOE/ER/75698–T1) **Engineering faculty forum: Final report, June 1, 1993–May 31, 1994.** Baldwin, L.V. National Technological Univ., Fort Collins, CO (United States). [1994]. 369p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER75698. Order Number DE95001895. Source: OSTI; NTIS; GPO Dep.

The goal of the project was to develop and broadcast monthly one-hour teleconferences to support the professional development of engineering faculty. The "Engineering Faculty Forum" was available nationwide over the NTU Satellite Network and was also available from a C-Band Satellite. There was no cost to participate in the live teleconferences for the two year period. The programs were developed in response to a questionnaire sent to engineering faculty members across the United States. Copies of the flyers and a print out of each course participation form has been included as a part of this report.

927 (DOE/MC/30127–3917) **Jointly sponsored research program: Quarterly technical progress report, April–June, 1994.** Western Research Inst., Laramie, WY (United States).

[1994]. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-93MC30127. (WRI–94-R026). Order Number DE95001477. Source: OSTI; NTIS; GPO Dep.

Objectives, accomplishments, procedures, and results are briefly described for each of the following 18 research projects: Development and demonstration of a practical electric downhole steam generator for thermal recovery of heavy oil and tar; Wetting behavior of selected crude oil/brine/rock systems; Coal gasification, power generation, and product market study; The impact of leachate from Clean Coal Technology waste on the stability of clay liners; Investigation of coprocessing of heavy oil, automobile shredder residue, and coal; Injection into coal seams for simultaneous CO_2 mitigation and enhanced recovery of coalbed methane; Optimization of carbonizer operations in the FMC Coke Process; Chemical sensor and field screening technology development; Demonstration of the Koppelman Series C Process using a batch test unit with Powder River Basin coal as feed; Remote chemical sensor development; Market assessment and technical feasibility study of PFBC ash use; Solid-state NMR analysis and interpretation of naturally and artificially matured kerogens; CROW™ field demonstration with bell lumber and pole; "B" series pilot plant tests; In situ treatment of manufactured gas plant contaminated soils demonstration program; Development and demonstration of a wood-fired gas turbine system; NMR analysis of Mowry Formation shale from different sedimentary basins; and Acid-mine drainage prevention, control, and treatment technology development for the Stockett/Sand Coulee Area.

928 (DOE/NV–382) **Performance measurement process, guidance document.** Bellman, R.; Droemer, D.; Lohmann, M.; Miller, C. USDOE Nevada Operations Office, Las Vegas, NV (United States). Jun 1994. 80p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002817. Source: OSTI; NTIS; GPO Dep.

Performance Measures are recognized as an important element of all Total Quality Management Programs. Managers and supervisors directing the efforts of an organization or a group have a responsibility to know how, when, and where to institute a wide range of changes. These changes cannot be sensibly implemented without knowledge of the appropriate information upon which they are based. In addition, among individual DOE/NV Family members, there is currently no standardized approach to developing and implementing performance measurement systems. As a result, performance measures have not been fully adopted to gauge the success of the various quality management programs practiced by Family members. To address these issues, the members of the Department of Energy Nevada Operations Office (DOE/NV) Family Quality Forum commissioned a work group to study the development, implementation, and operation of performance measurement systems. This guidance document, the product of the work group, provides a comprehensive, step-by-step explanation of how to develop performance measurements at any level within an organization and how to evaluate their effectiveness. The accompanying Case Study illustrates a practical example of how to put the concepts of the guidance document to use. The implementation of performance measurements for a specific process should involve as many cognizant employees as possible to stimulate ideas and reinforce the notion that this is a team effort requiring buy-in from all involved in order to succeed.

929 (NEDO-P–9328) **Research on the promotion measures to introduce new energy and energy-saving technologies with a leasing system.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 111p. (In Japanese). Order Number DE95714801. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Effects of introducing the leasing system were studied in order to promote the introduction of photovoltaic power generation, wind power generation and other new energy technologies, and phosphoric acid fuel cell, regional air conditioning and other energy efficiency-heightening technologies. Judging from the result of investigating its needs, the introduction of leasing system is most effective when the technological reliability and safety have been established with a cost differential made small, to a certain extent, from the existing energy. The introduction of leasing system is considered effective not from the point of view that, in order to reduce the initial introduction cost, the leasing system is the best measures of investment in the facilities for the introduction of new energy and energy-saving technologies, but from the point of view that the addition of leasing system as one of the preferential measures widens the user's selectivity among the debt, self-funds and leasing. The following tasks are raised for the introduction of leasing system: Determination of leasing term. Determination of insurance rate. Study of leasing for the household use. Development of leasing system as commodities fulfilling the user's needs. 32 refs., 25 figs.

930 (ORNL/TM–12671) **National Information Infrastructure Education Forum: A summary report.** Tonn, B.E.; Oliver, C.E. Oak Ridge National Lab., TN (United States). May 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-9310374–Summ.: National Information Infrastructure (NII) education forum, Arlington, VA (United States), 6-8 Oct 1993). Order Number DE95001771. Source: OSTI; NTIS; GPO Dep.

The National Information Infrastructure (NII) Education Forum was held on October 6-8, 1993, in Arlington, Virginia. The Forum was sponsored by the Office of Scientific Computing, U.S. Department of Energy (DOE). Its purpose was to discuss technology for K-12 education and what role DOE and its national laboratories could play in developing, disseminating, and using technology for K-12. The Forum brought together over 120 people from across the nation. Participants represented six groups: national laboratories; education research institutions; K-12 teachers and administrators; industry; federal agencies; and other institutions. The Forum consisted of a series of structured presentations from each of these six groups; technology demonstrations; and open, small group discussions. The presentations covered the following: important K-12 education and computing issues, national laboratory capabilities, other federal sector initiatives, and industry perspectives. The demonstration room had over 20 computers networked to the Internet. Workshop participants were shown (1) how to use the Internet to access resources anywhere in the world, (2) state-of-the-art network video teleconferencing technology, (3) multi-media technology, and (4) various other educational software systems.

931 (PNL–10114) **The United States Department of Energy Office of Industrial Technology's Technology Benefits Recording System.** Hughes, K.R.; Moore, N.L. Battelle Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001853. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Energy (DOE) Office of Industrial Technology's (OIT's) Technology Benefits Recording System (TBRS) was developed by Pacific Northwest Laboratory (PNL). The TBRS is used to organize and maintain records of the benefits accrued from the use of technologies developed with the assistance of OIT. OIT has had a sustained emphasis on technology deployment. While individual program managers have specific technology deployment goals for each of their ongoing programs, the Office has also established a separate Technology Deployment Division whose mission is to assist program managers and research and development partners commercialize technologies. As part of this effort, the Technology Deployment Division developed an energy-tracking task which has been performed by PNL since 1977. The goal of the energy-tracking task is to accurately assess the energy savings impact of OIT-developed technologies. In previous years, information on OIT-sponsored technologies existed in a variety of forms–first as a hardcopy, then electronically in several spreadsheet formats that existed in multiple software programs. The TBRS was created in 1993 for OIT and was based on information collected in all previous years from numerous industrial contacts, vendors, and plants that have installed OIT-sponsored technologies. The TBRS contains information on technologies commercialized between 1977 and the present, as well as information on emerging technologies in the late development/early commercialization stage of the technology life cycle. For each technology,

details on the number of units sold and the energy saved are available on a year-by-year basis. Information regarding environmental benefits, productivity and competitiveness benefits, or impact that the technology may have had on employment is also available.

932 (PNL–10188) **Cooperative study of clinical benefits from use of the fully portable blood irradiator.** Hungate, F.P. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002842. Source: OSTI; NTIS; INIS; GPO Dep.

This report looks at the clinical benefits from use of a fully portable blood irradiator, techniques developed by Pacific Northwest Laboratory. Significant accomplishments included the following: blood irradiators were successfully fabricated by PNL; irradiators were activated at the University of Missouri and quality tested at PNL; A-V shunts for irradiators were successfully fabricated in the PNL plastics shop; all activities necessary for experimental work on animals using the blood irradiators were completed.

933 (PNL-SA–23687) **Hanford technology integration: A success story.** Stenehjem, E.J.; Pond, D.J.; Widrig, J.E.; Deonigi, D.E. Pacific Northwest Lab., Richland, WA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940225–125: Waste management '94, Tucson, AZ (United States), 27 Feb - 3 mar 1994). Order Number DE95001431. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes recent activities of the Richland Northwest Laboratory in the area of technology transfer. A major thrust within major DOE laboratories has been the implementation of technology transfer activities which transfer scientific knowledge, transfer technologies developed to deal with the production or conservation of energy, and transfer spinoff technologies into the private sector. Several activities which are in process or have been implemented are described in this paper.

934 (SAND–94-1508) **US House of Representatives Committee on Energy and Commerce Subcommittee on Energy and Power.** Narath, A. Sandia National Labs., Albuquerque, NM (United States). Jun 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94018747. Source: OSTI; NTIS; GPO Dep.

The President of Sandia National Laboratories, Albert Narath, made this presentation to the congressional subcommittee on February 3, 1994. In it he outlines the convergence of the defense and civilian technology bases, technology leadership, the government/industry relationship in science and technology, historical laboratory effectiveness, Sandia's evolution to a multiprogram laboratory, Sandia's energy programs today, planning for a changing operating environment, Sandia's strategy for enhancing industrial competitiveness, R&D partnerships, technology deployment, entrepreneurial initiatives, and current DOE planning efforts. Appendices contain information on technology transfer initiatives in the fields of high-performance computing, materials and processes for manufacturing, energy and environment, microelectronics and photonics and advanced manufacturing. Also included are customer response highlights, information on dual-use research centers and user facilities, examples of technology transfer achievements, major accomplishments of 1993, and questions and answers from the subcommittee.

935 (SAND–94-2137) **Using Process Quality Management Improvement (PQMI) to develop business processes and procedures.** Weeks, J. (TechSource Consulting, Inc., Albuquerque, NM (United States)); Weeks, B.; Beradino, A. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002959. Source: OSTI; NTIS; GPO Dep.

As the product requirements are defined, business processes and procedures should be redeveloped in order to fully realize the benefits of the product. Process Quality Management Improvement (PQMI) can be used as a methodology to redevelop business processes and procedures for an organization. Business processes and procedures are an integral part of the Product Realization Process (PRP). This document focuses on the development of business processes and procedures. The business processes and procedures should be developed concurrently with the product. This enables the product and project as a whole to be transitioned smoothly and successfully. Without business processes and procedures to back up the changes brought with the new product, the product will not be used to its full potential and the transition will not be as smooth. Developing business processes and procedures lends itself to the PQMI methodology because PQMI calls for all the information needed to develop business processes and procedures and ensures the business processes and procedures are developed in a quality manner. The PQMI steps are: (1) Establishing process management responsibilities; (2) Defining Processes and Identifying Customer Requirements; (3) Defining and Establishing Measures; (4) Assessing Conformance to Customer Requirements; (5) Investigating Processes to Identify Improvement Opportunities; (6) Ranking Improvement Opportunities and Setting Objectives; and (7) Improving Process Quality. The successful implementation of a product can be attributed to the standardization of business processes and procedures. These business processes and procedures describe in detail the day to day operations of a project. The development of business processes and procedures provide an environment for agile product realization.

936 (SAND–94-2581C) **Partnering with Sandia National Laboratories through alliances or consortia.** Winchell, B.M. Sandia National Labs., Livermore, CA (United States). Apr 1994. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410228–1: Licensing Executives Society annual meeting, Waikoloa, HI (United States), 16-19 Oct 1994). Order Number DE95001526. Source: OSTI; NTIS; GPO Dep.

To better facilitate working with industry, groups of industrial participants, and partners in alliances or consortia, Sandia National laboratories presents information helpful to those outside groups as to the forms of arrangements that may be used to better facilitate partnering relationships between Sandia National Laboratories and consortia or alliances of outside parties. It is expected that these alliances and consortia will include both large and small for-profit industrial concerns, as well as not-for-profit entities such as universities, institutes, other research facilities, and other nonprofit institutions or consortia containing institutions. The intent of this report is to provide such outside groups with information that will facilitate rapid interactions with Sandia National Laboratories through some of these forms of business which will be discussed in this report. These are not the only approaches to facilitating business interactions with Sandia National Laboratories and it is not intended that this report be legal advice or required approaches to doing business with Sandia National Laboratories. The intent of this report is merely to suggest ways in which Sandia National Laboratories can work with outside parties in the most expeditious manner.

937 (WHC-SA–2683) **Advances in technology transfer at Federal Facilities.** Silva, R.R. Jr. Westinghouse Hanford Co., Richland, WA (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9411139–1: Optimizing the technology transfer function, Chicago, IL (United States), 2-4 Nov 1994). Order Number DE95001534. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site, located in the southeast portion of the state of Washington, is a 1450-hectare (560 square miles) reservation that was selected by the US Government in 1942 for production of the world's first nuclear weapons materials. For more than 40 years, defense production operations at Hanford generated hazardous and radioactive materials and wastes that for the most part remain there today. Environmental restoration of the Hanford Site is the primary mission of the Westinghouse Hanford Company (WHC) and it is also the thrust of the Tri-Party agreement among the US Environmental Protection Agency, the Washington State Department of Ecology and the US Department of Energy. Restoration will require treatment of about 1400 individual locations that are contaminated by chemically hazardous wastes, radioactive wastes, nonhazardous wastes and mixed hazardous and radioactive wastes.

These locations include burial sites, storage facilities, obsolete buildings, settling ponds, waste cribs and large and small areas of near-surface and deep soil contamination. Burial trenches contain an estimated 109,000 cubic meters of low-level solid wastes contaminated with hazardous chemicals and radioactive materials. Approximately 450 sites were contaminated by discharge of liquids to the ground and there are about 250 additional areas where waste materials were spilled. At one time, ditches carried water from processing plants to settling/cooling ponds and 131 cribs were used over the years to dispose of slightly radioactive liquid wastes.

938 (WHC-SP–1125) **Special initiatives FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 5.0.** Jekel, R.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002458. Source: OSTI; NTIS; INIS; GPO Dep.

The Special Initiatives mission supports programmatic requests for service to DOE offices, other organizations and agencies. These requests can include the following: Supporting priority DOE initiatives; Researching special programs; Studying locating new activities at the Hanford Site; Producing specialty materials; Providing consulting support to other sites; Managing a broad spectrum of US and international test programs.

939 (Y/TS–1228) **The Y-12 Plant - a model for environmental excellence.** Oak Ridge National Lab., TN (United States). [1994]. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95002054. Source: OSTI; NTIS; GPO Dep.

The Department of Energy's Y-12 Plant, located in Oak Ridge, Tennessee, occupies more than 800 acres and has a work force of over 4,000 employees. The Y-12 Plant is managed by Martin Marietta Energy Systems, Inc., a subsidiary of Martin Marietta Corporation. Although mission emphases at the Y-12 Plant have evolved and changed with the easing of international tensions, the Plant continues to serve as a key manufacturing unit and technology demonstration center for the Department of Energy and the nation. The Y-12 Plant has undergone many changes in the last 14 years. One of the most dramatic changes has occurred in the environmental programs with measurable improvements in environmental quality, the development of an award-winning pollution prevention program, and the institution of an environmentally-conscious work ethic among the work force. Because the plant is committed to achieving excellence, not just compliance with laws and regulations, a highly structured, multimedia environmental management program is in place. This program, combined with a commitment to protect the environment while striving for continued improvement, has placed Y-12 in the position to reach excellence. As a result of the Y-12 Plant's changing mission, they are now working closely with American industry through technology transfer to share their experiences and "lessons learned"–including environmental and pollution prevention technology. To facilitate this effort, the Oak Ridge Centers for Manufacturing Technology has been established at the Y-12 Plant. Through the Centers, the Oak Ridge staff applies skills, capabilities, and facilities developed over a 50-year history of the Oak Ridge Complex to a variety of peacetime missions. The services found at the Centers are a key to helping America's businesses–both small and large–compete in the global marketplace while protecting the nations environment and conserving its resources.

2906 Nuclear Energy

Refer also to citation(s) 185, 561, 797, 798, 906, 1417, 1695

940 (CONF-9308217–, pp. 24, Paper 2) **History of US uranium mining and milling.** Nelson, R. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany*. 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

Presented are historical aspects of USA uranium mining and mills, including the following topics: history, government involvement, private industry, geologic information; economic reserves, environmental and health concerns, Three Mile Island, future for uranium demand and mining.

941 (DOE-STD–1082-94) **Preparation, review, and approval of implementation plans for nuclear safety requirements.** USDOE, Washington, DC (United States). Oct 1994. 31p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001461. Source: OSTI; NTIS; INIS; GPO Dep.

This standard describes an acceptable method to prepare, review, and approve implementation plans for DOE Nuclear Safety requirements. DOE requirements are identified in DOE Rules, Orders, Notices, Immediate Action Directives, and Manuals.

942 (DPW–53-1413) **Personnel requirements.** Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). 2 Dec 1953. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. Order Number DE95001669. Source: OSTI; NTIS; GPO Dep.

The hiring schedule was reviewed by the same method that was used in the reference letter with essentially the same results; that is, that we should hire approximately 125 technical graduates during the hiring year 1953-54. In the belief that possibly this method was a bit too crude for this stage of the Plant development, I have applied another one, which I believe is fairly independent of the previous method of calculation since it is directed at a consideration of only people required who have a technical background.

943 (INIS-mf–13988) **Environmental and health effects of various energy systems.** Niehaus, F. (International Atomic Energy Agency, Vienna (Austria). Safet Assessment Section). No corporate text available. 1994. 10p. (CONF-9310172–: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993). Order Number DE95604093. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation addresses risks to individuals, to society in general, the risks of severe accidents, and aspects of radioactive waste disposal. 4 refs, 8 figs, 3 tabs.

944 (INIS-mf–13989) **Public information and education in Canada.** Macpherson, J.A. (AECL Research, Mississauga, ON (Canada). Public Affairs). No corporate text available. 1993. 13p. (CONF-9310172–: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993). Order Number DE95604094. Source: OSTI; NTIS (US Sales Only); INIS.

The history of providing public information on nuclear energy in Canada for more than 40 years is described. Information centers are part of all nuclear power plants and they receive many thousands of visitors each year. Until the 1970s public information programs were relatively easy. There was a lot of interest in nuclear energy, and there was little debate about it or opposition to it. But times have changed, and Canadian public information strategies and tactics have evolved to meet challenge of answering increasing public concerns. In the past 20 years Canada has gone through three phases in relationship with the public: information, communication, participation. Activities on implementation of these phases are outlined.

945 (INIS-mf–13990) **Public information and education in England.** Ginniff, M.E. No corporate text available. 1993. 11p. (CONF-9310172–: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993). Order Number DE95604095. Source: OSTI; NTIS (US Sales Only); INIS.

The paper discusses the importance of public information and education in the field of energy and particularly in the field of nuclear power development. The attempt is made to explain some issues connected with the nuclear fuel cycle. Appendix contains comments on the United Kingdom educational materials in this area.

946 (INIS-mf–13991) **NPT safeguards and the peaceful use of nuclear energy.** Kyd, D.R. (International Atomic Energy Agency, Vienna (Austria). Div. of Public Information). No corporate text available. Oct 1993. 8p. (CONF-9310172–: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993).

Order Number DE95604096. Source: OSTI; NTIS (US Sales Only); INIS.

Origin of safeguards system and of comprehensive safeguards agreements, assurance given by IAEA safeguards, penalties and sanctions in case of breach of a safeguards agreement, recent experiences with Iraq, South Africa and DPRK as well as limits of the safeguards system are described.

947 (INIS-mf–13992) **Nuclear development in Korea.** Lee Byong Whi (Korea Advanced Inst. of Science and Technology, Seoul (Korea, Republic of)). No corporate text available. Oct 1993. 11p. (CONF-9310172–: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993). Order Number DE95604097. Source: OSTI; NTIS (US Sales Only); INIS.

The Korean research and development project "evelopment of Next Generation Reactor Technology" aimed at the 21st century is briefly outlined. Activities directed to improvement of public acceptance of nuclear energy, the public information and education on the advanced nuclear reactor and fuel cycle technology are described.

948 (INIS-mf–13993) **Public acceptance (PA) activities of nuclear power in Japan.** Yamada, Masafumi (ANRE, MITI (Japan). Public Information Office of Nuclear Energy); Iguchi, Tatsuro. No corporate text available. Oct 1993. 10p. (CONF-9310172–: International logic programming symposium, Vancouver (Canada), 26-29 Oct 1993). Order Number DE95604098. Source: OSTI; NTIS (US Sales Only); INIS.

At the first part of presentation present status of nuclear power development in Japan is described. Then results of poll on nuclear energy acceptance by population are analyzed. Further, current activities and future efforts directed to broad understanding by people benefits of nuclear energy are described. 6 figs.

949 (INIS-mf–13994) **Opening remarks.** Kyd, D.R. (International Atomic Energy Agency, Vienna (Austria). Div. of Public Information). No corporate text available. Nov 1993. 6p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604099. Source: OSTI; NTIS (US Sales Only); INIS.

In his opening remarks Mr. David R. Kyd briefly described the IAEA mission. Then he outlined main aim of the seminar which is bring together journalists, educators, officials and other specialists to let them hear and put questions to experts on various aspects of nuclear energy and techniques. Further he analyzed problems and prospects of energy development in Asia and particularly in China, including environmental considerations. The final part of the remarks was devoted comparative evaluation of different energy production technologies.

950 (INIS-mf–13995) **Welcome remarks.** Zhao Hong (China National Nuclear Corp., Beijing, BJ (China)). No corporate text available. 1993. 5p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604100. Source: OSTI; NTIS (US Sales Only); INIS.

In his opening remarks Mr. Zhao Hong stressed the importance of nuclear power for further economic development. He noticed that one of the main factors to obstruct the progress of nuclear energy is nuclear dread in public psychology and that enhancement of the public acceptance of nuclear power is an important task to promote the development of nuclear power. Than he described activities in China in public relation work in the field of nuclear energy. Importance of international cooperation on peaceful use of nuclear energy and supporting non-proliferation regime was stressed.

951 (INIS-mf–13996) **NPT and the peaceful use of nuclear energy.** Pellaud, B. (International Atomic Energy Agency, Vienna (Austria). Dept. of Safeguards). No corporate text available. 1993. 12p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604101. Source: OSTI; NTIS (US Sales Only); INIS.

In his opening remarks the author spoke on the role of IAEA safeguards in the process of international verification and confidence building that peaceful nuclear programmes are not used for the production of nuclear weapons or other nuclear explosive devices.

952 (INIS-mf–13997) **Nuclear information and education experience in Canada.** Macpherson, J.A. (AECL Research, Mississauga, ON (Canada)). No corporate text available. 1993. 13p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604102. Source: OSTI; NTIS (US Sales Only); INIS.

The history of providing public information in Canada for more than 40 years is described.

953 (INIS-mf–13998) **Atomic energy policy of Japan, especially plutonium utilization policy.** Moriguchi, Y. (Science and Technology Agency, Tokyo (Japan). Nuclear Fuel Div.). No corporate text available. 1993. 3p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604103. Source: OSTI; NTIS (US Sales Only); INIS.

The necessity of plutonium use in Japan is discussed. Basic policy regarding plutonium use and future plutonium utilization programme is described including such an aspect as management of plutonium from dismantled nuclear weapons.

954 (INIS-mf–13999) **Nuclear techniques in agriculture and industry in China.** Lu Yanxiao (China Nuclear Information Centre, Beijing, BJ (China)). No corporate text available. 1993. 7p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604104. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation describes the application of nuclear techniques related to information acquisition by radiotracer and isotope-instrument getting physical parameters from measured substances, medical diagnostic information, evolution of novel substances or modification of materials through interaction of ionizing radiation with matter,mutation breeding in agriculture, cancer therapy in medicine, sterilization of medical products.

955 (INIS-mf–14301) **Development of nuclear energy and nuclear policy in China.** You Deliang (China National Nuclear Corp., Beijing, BJ (China). General Office of Administration). No corporate text available. Nov 1993. 9p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604105. Source: OSTI; NTIS (US Sales Only); INIS.

Status of nuclear power development in China, nuclear policy and nuclear power programme are described. Issues regarding nuclear fuel cycle system, radioactive waste management and international cooperation in the field of peaceful use of nuclear energy are discussed.

956 (INIS-mf–14302) **Benefits of nuclear power in a developing country. Nuclear power development policy in Korea.** Chung, Joon Keuk (Korea Atomic Energy Research Inst., Taejon (Korea, Republic of). Nuclear Public Information). No corporate text available. 1993. 18p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604106. Source: OSTI; NTIS (US Sales Only); INIS.

History and modern status of electricity production development in Republic of Korea with shift from oil to nuclear power is described. Figs and tabs.

957 (INIS-mf–14303) **Safety system of nuclear power plants and its management example.** Cai Jianping (Shanghai Nuclear Engineering Research and Design Inst., Shanghai (China)). No corporate text available. 1993. 25p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604107. Source: OSTI; NTIS (US Sales Only); INIS.

Safety system of nuclear power plants(NPP) and its management example in pressurized water reactor NPP, e.g. Qinshan NPP, the first NPP designed and constructed domestically in China are described. 5 figs.

958 (INIS-mf–14304) **Environmental and health effects of various energy systems.** Niehaus, F. (International Atomic Energy Agency, Vienna (Austria). Safet Assessment Section). No corporate text available. 1993. 10p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604108. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation addresses risks to individuals, to society in general, the risks of severe accidents, and aspects of radioactive waste disposal. 4 refs, 8 figs, 3 tabs.

959 (INIS-mf–14305) **Mass media and nuclear energy - IAEA's role.** Kyd, D.R. (International Atomic Energy Agency, Vienna (Austria). Div. of Public Information). No corporate text available. Nov 1993. 6p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604109. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation covers the following areas: the wide spectrum of media outlets that the IAEA seeks to serve and their differing needs; the resources available to the IAEA for that purpose; the way in which IAEA endeavours to disseminate authoritative, reliable nuclear-related information to media; the exceptional role the IAEA may be called on to play in emergency situations.

960 (INIS-mf–14306) **Nuclear information and education experience in the United Kingdom.** Ginniff, M.E. No corporate text available. 1993. 11p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604110. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation discusses the importance of public information and education in the field of energy and particularly in the field of nuclear energy development. The attempt is made to explain some issues connected with the nuclear fuel cycle. Appendix contains comments on the United Kingdom educational materials in this area.

961 (INIS-mf–14307) **Radiation in everyday life.** Valentin, J. (Swedish Radiation Protection Inst., Stockholm (Sweden)). No corporate text available. 1993. 9p. (CONF-9311250–: Regional seminar on nuclear energy, a new energy for development, Shanghai (China), 1-3 Nov 1993). Order Number DE95604111. Source: OSTI; NTIS (US Sales Only); INIS.

The presentation attempts to provide brief answers to the following questions: what is the cause of radiation? How much radiation are we exposed to? How dangerous is radiation? 2 refs, 5 figs, 1 tab.

962 (INIS-mf–14370) **Current status of nuclear power development.** Dias, P.M. Atomic Energy Authority, Colombo (Sri Lanka). 1994. 22p. (CONF-9402109–: Workshop on nuclear power and energy planning, Colombo (Sri Lanka), 16-18 Feb 1994). Order Number DE95604084. Source: OSTI; NTIS (US Sales Only); INIS.

Nuclear power is not a viable energy source for Sri Lanka at present because of a number of reasons, the main reason being the non-availability of small and economically viable nuclear power plants. However several suppliers of nuclear power plants are in the process of developing small and medium power plants (SMPRs) which could be economically competitive with coal. The paper deals with past and future trends of nuclear power plants, their economics and safety. It also deals with environmental effects and public acceptance of nuclear power plants.

963 (INIS-mf–14392, pp. 79-99) **Nuclear power. Status and development trends.** Dastidar, P. (International Atomic Energy Agency, Vienna (Austria)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The nuclear power status and developing trends have been shown and discussed. At the end of 1992 there were 424 nuclear units connected to electricity supply networks in 30 countries with total 331 GW installed capacity and 72 nuclear units under construction in 19 countries with 60 GW of total capacity. It represents at that moment 17% of total electricity generation worldwide. The future developing perspectives depends on several factors. Among them the national economy development as well as energy demand and supply, national energy policies, environmental and health impacts, national economic circumstances, regulatory requirements and procedures as well as public acceptance has been listed as the most important. 5 refs, 7 figs, 1 tab.

964 (INIS-mf–14392, pp. 103-110) **The energy issue in Sweden. Can society handle technology poorly understood by its citizens?.** Sokolowski, E. (Nuclear Training and Safety Center, Nykoeping (Sweden)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The public attitudes towards different energy options has been shown on the example of Sweden. Several factors have influenced upon negative attitude of a part of public towards nuclear power. Main of them are: the possibility of a new major accident anywhere in the world, a trouble with a Sweden nuclear plants, an unfavorable climate in key foreign countries particularly in U.S.A.), the persisting educational gap to the public as regards safety principles, radiations, etc. on the other hand there are some positive facts impacting on the public acceptance: a new cost consciousness of the public because of recession, back of environmentally and economically acceptable alternatives, a gradual familiarization and continued education. 1 fig.

965 (INIS-mf–14392, pp. 113-116) **Development of nuclear power in Sweden.** Sokolowski, E. (Nuclear Training and Safety Center, Nykoeping (Sweden)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The history and development of nuclear energetics in Sweden has been described. Up to now 12 units (9 BWR and 3 PWR nuclear reactors) with total 70 TWh electric power is being working in Sweden. If the same power were installed as coal-fired units, emissions of 65 million tons of CO_2, 240,000 tons of SO_2 and 140 tons of NO_x would be expected. 1 tab.

966 (INIS-mf–14392, pp. 117-127) **Nuclear power in Russia. Status and development trends.** Gagarinski, A. (Russian Research Centre, Kurchatov Institute, Moscow (Russian Federation)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The history of development of nuclear power in Russia from 1954 up to now has been described. There was two periods in it, before and post Chernobyl accident in 1986, when whole research works, construction and extension of NPP were interrupted on 39 sites of total capacity 109 GW. The quantitative estimates of various scenarios of nuclear power development up to 2010 beginning of 1993 has been presented. 5 figs.

967 (INIS-mf–14392, pp. 129-135) **Nuclear energy in Ukraine. State and problems.** Steinberg, N. (The State Committee on Nuclear and Radiation Safety, Kiev (Ukraine)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The scale and problems of nuclear energy in Ukraine has been discussed in detail. The 73.7 TWh was produced by Ukraine's NPP's in 1991. At present there are five NPP's with the total power 13.88 GW. That is about one third's of overall electricity generated

in Ukraine. There are a lot of problems with maintenance and safety of NPP as well as the legislative and regulatory framework, personnel education, fuel supply and spent fuel treatment. The manners of solution of these problems, international help cooperation have been suggested and discussed. 2 tabs.

968 (INIS-mf–14392, pp. 167-171) **Nuclear power in Germany.** Brosche, D. (Bayernwerk AG, Muenchen (Germany)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

Short communication. NUCLEAR ENERGY/federal republic of germany; ENVIRONMENTAL IMPACTS; NUCLEAR POWER PLANTS; RADIATION PROTECTION

969 (INIS-mf–14392, pp. 173-181) **Nuclear power in Finland. Present status and trends.** Wahlstroem, B. (Imatran Voima Oy (IVO), Helsinki (Finland)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The present status and development trends in nuclear power in Finland has been shown and discussed. Finland has 4 nuclear power units, with total power capacity of 2300 MW. The consumption of primary energy per capita is one of the highest in Europe. This situation decided that new power capacity must be constructed in the future. Industry and power companies would perfect nuclear option, public opinion is divided. The Parliament is supposed to vote on the ratification of pro-nuclear decision during the 1993. 6 figs.

970 (PNL–10197) **Airborne Multisensor Pod System (AMPS) data access concept.** Jou, Jiing-Yih J.; Meitzler, W.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002586. Source: OSTI; NTIS; GPO Dep.

The purpose of this document is to provide the conceptual design for accessing data collected under the Airborne Multisensor Pod System (AMPS) program and for accessing data about that data. The purpose of the AMPS program is to provide multisensor data for data fusion research as it applies to arms control treaty verification, non-proliferation surveillance, and related programs. Secondary objectives include sensor development and technology demonstration. The program was established by the U.S. Department of Energy (DOE), Office of Arms Control and Non-proliferation (DOE/AN) and is integrated into the overall DOE AN-10.1 technology development program. The AMPS program interacts with other technology programs of DOE/NN-20. The AMPS program participants include five DOE laboratories. Four will be responsible for collecting and supplying data to AMPS data researchers: (1) Lawrence Livermore National Laboratory (LLNL); (2) Remote Sensing Laboratory (RSL); (3) Sandia National Laboratories (SNL); (4) Savannah River Technology Center (SRTC). The Pacific Northwest Laboratory (PNL), has been assigned data management responsibility for the program, which is defined as the process of planning, acquiring, organizing, qualifying and disseminating data. Data ranges from single sensor readings, to high resolution images, to video. The potential volume of data to be collected under the AMPS program will require considerable management effort. The AMPS program specifies a distributed approach for the sharing and management of AMPS data. This approach shares the burden of data distribution across the DOE laboratories, which will be responsible for AMPS instruments development and implementation and the data those instruments produce. This approach will also provide the laboratories with direct control over the distribution of the data for which they are responsible.

2908 Heat Utilization

Refer also to citation(s) 894, 987, 1048, 1055, 1159

2910 Conservation

971 (CONF-9111345–) **Energy conservation at the customer's: Financial support models of municipal utility companies.** Arbeitsgemeinschaft Kommunaler Versorgungsunternehmen zur Foerderung Rationeller, Sparsamer und Umweltschonender Energieverwendung und Rationeller Wasserverwendung (ASEW) im VKU, Koeln (Germany). 1991. 137p. (In German). From ASEW seminar: Energy conservation at the customer's - financial support models of municipal utility companies; Hannover (Germany); 19 Nov 1991. Order Number DE95711811. Source: OSTI; NTIS (US Sales Only).

In this report the following subjects are dealt with: 1. Government promotion in the area of rational use of energy and use of renewable enregy sources. 2. Financial assistance by municipal utility companies - results of the ASEW survey of April 1991. 3. Determination factors of financial concepts for the promotion of energy conservation investments. 4. Support of heating system conversion in connection with a regional program. 5. Incentive programs for the use of economic household appliances. (UA)

2920 Supply, Demand, and Forecasting

Refer also to citation(s) 93, 923, 980, 981, 993, 994

972 (DOE/EIA–0538(94/95-6)) **Winter fuels report: Week ending November 11, 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Nov 1994. 76p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002936. Source: OSTI; NTIS; GPO Dep.

The Winter Fuels Report is intended to provide concise, timely information to the industry, the press, policy makers, consumers, analysts, and State and local governments on the following topics: distillate fuel oil net production, imports and stocks on a US level and for all Petroleum Administration for Defense Districts (PADD) and product supplied on a US level; propane net production, imports and stocks on a US level and for PADD's 1, 2, 3; natural gas supply and disposition and underground storage for the US and consumption for all PADD's; as well as selected National average prices. Residential and wholesale pricing data for heating oil and propane for those States participating in the joint Energy Information Administration (EIA)/State Heating Oil and Propane Program; crude oil and petroleum price comparisons for the U.S. and selected cities; and a 6–10 Day, 30-Day, and 90-Day outlook for temperature and precipitation and US total heating degree-days by city.

973 (DOE/EP/10050–T1) **Regional overview of Latin American and Caribbean energy production, consumption, and future growth: Report series No. 1.** Wu, K. East-West Center, Honolulu, HI (United States). Jul 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EP10050. Order Number DE95001815. Source: OSTI; NTIS; GPO Dep.

The Latin American and Caribbean region - comprising Mexico, Central and South America, and the Caribbean - is relatively well endowed with energy resources, although the distribution of these resources is uneven across countries. The region produces more energy than it consumes, and the surplus energy, which amounts to 3.6 million barrels of oil equivalent per day (boe/d), is mostly oil. While the region's total oil (crude and products) exports decreased from 4.4 million barrels per day (b/d) in 1981 to 3.8 million b/d in 1992, its net oil exports increased from about 1.6 million b/d in 1981 to 2.8 million b/d in 1992. In 1993, the surplus oil in Latin America and the Caribbean remained at 2.8 million b/d. This report analyzes the key issues of the Latin American and Caribbean energy industry and presents the future outlook for oil, gas, coal, hydroelectricity, and nuclear power developments in the region. In addition, the status of biomass energy, geothermal, and other noncommercial energy in the region will be briefly discussed in the context of overall energy development. The rest of the report is organized as follows: Section II assesses the current situation of

Latin American and Caribbean energy production and consumption, covering primary energy supply, primary energy consumption, downstream petroleum sector development, and natural gas utilization. Section III presents the results of our study of future energy growth in Latin America. Important hydrocarbons policy issues in the region are discussed in Section IV, and a summary and concluding remarks are provided in Section V.

974 (DOE/EP/10050–T2) **Energy profiles of selected Latin American and Caribbean countries: Report series No. 2.** Wu, K. East-West Center, Honolulu, HI (United States). Jul 1994. 247p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EP10050. Order Number DE95001816. Source: OSTI; NTIS; GPO Dep.

Countries in this report include Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Trinidad and Tobago, and Venezuela. These ten countries are the most important oil and gas producers in the Latin American and the Caribbean region. In the following sections, the primary energy supply (oil, gas, coal, hydroelectricity, and nuclear power whenever they are applicable), primary energy consumption, downstream oil sector development, gas utilization are discussed for each of the ten countries. The report also presents our latest forecasts of petroleum product consumption in each country toward 2000, which form the basis of the outlook for regional energy production and consumption outlined in Report No 1. Since the bulk of primary energy supply and demand is hydrocarbons for many countries, brief descriptions of the important hydrocarbons policy issues are provided at the end of the each country sections.

2930 Policy, Legislation, and Regulation

Refer also to citation(s) 479, 481, 484, 485, 907, 908, 919, 1089, 1090, 1091, 1092, 1093, 1094

975 (CONF-9308217–, pp. 13, Paper 16) **Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic.** Nelson, R.A.; Chernoff, A.R.; Mager, D.; Goldammer, W. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

The former Soviet Union demands for uranium feed materials were primarily met by the East German Republic. A small area 200 km long and 50 km wide in the provinces of Saxony and Thuringia provided more than half of the uranium concentrate processed by the Soviet Union, and used for nuclear weapons development and power generation. With the majority of the ore processed in Germany of an average lower grade than a number of deposits found around the world, the mining and milling resulted in an enormous scale of surface disturbance and quantities of mill tailings concentrated in a relatively small densely populated geographical area. As a result of the re-unification of the two Germanies, all uranium extraction and processing activities were suddenly brought to a halt for economic reasons. The former soviet-East German corporation responsible for the uranium concentrate production was changed into a German state-operated company tasked with the facility decommissioning and environmental restoration. Code-named WISMUT (the German word for Bismuth) during the cold war, this organization was literally changed overnight from a self-sufficient, autonomously operating and state controlled effort into a public works, environmentally conscious corporation.

976 (CONF-9308217–, pp. 28, Paper 4) **The US DOE Environmental Restoration Program – a Washington perspective.** Lightner, R. (DOE, Washington, DC (United States)). Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

This is an overview of the environmental programs of the US government, US environmental policy including programs and program management, priorities, advocacy set up, and a discussion specifically of the Durango repository.

977 (DOE/IG–0183) **Initial evaluation of the Department of Energy Audit Report Tracking System (DARTS).** USDOE Office of Inspector General, Washington, DC (United States). 3 Jun 1982. 29p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002417. Source: OSTI; NTIS; GPO Dep.

This report is an evaluation of the Department of Energy Audit Report Tracking System (DARTS) during its initial 20 months of operation. The evaluation is required by the Office of Management and Budget (OMB) Circular A-73. The evaluation was conducted at three major Department of Energy (DOE) reporting offices (out of the 22 elements currently reporting)–the Washington Procurement Office of Operations and the Chicago and Oak Ridge Operations Offices. Those offices account for about 39 percent of the questioned costs reported in DARTS. The Office of the Controller has primary responsibility for DARTS. It was concluded that installation of DARTS marked a major advancement in the tracking, resolution, final settlement and reporting of the status of audit findings. The system provides the basis for ensuring that the Department receives optimal benefit from the Government's investment in audit effort. To be fully effective and reliable, however, several corrections to existing practices or procedures should be made. Several important categories of audit report findings (those dealing with indirect costs, subcontracts and, at Chicago, integrated contractor internal audits) are now excluded from DARTS even though these findings sometimes include significant questioned costs and opportunities for cost savings. These findings should be tracked. Conversely, the system tracks other audit reports that have no findings and could, therefore, be removed.

978 (ETDE/DE-mf–95708762) **Energy policy goals: Energy concept for Hanover. Module 1.** Schriften zur Stadtentwicklung, v. 56. Stadtwerke Hannover AG (Germany); Stadt Hannover (Germany). Referatfuer Stadtentwicklung. Jan 1992. 46p. (In German). Order Number DE95708762. Source: OSTI; NTIS (US Sales Only).

The brochure contains the full text of six decisions made by the senate of Hanover for the realisation of the energy-political goals of the Hanover energy supply concept. (UA)

979 (NEI-DK–1669) **Energy and the environment: Investigation carried out by the Energy Conservation Committee on the attitudes and behaviour of the public in relation to environmental protection and energy conservation.** Madsen, G. (AIM Research (Denmark)); Nielsen, J.; Scheby, J. AIM Research A/S, Copenhagen (Denmark); ScanTest MarkedsDialog, Copenhagen (Denmark). Dec 1992. 70p. (In Danish). Order Number DE95707338. Source: OSTI; NTIS.

Prepared for Energi-Spareudvalget.

A description of an investigation carried out by the Danish Committee for Energy Saving (Energi-Spareudvalget) the aim of which was to clarify the nature of the Danish public's attitudes towards energy saving and the broader issue of environmental protection. Personal interviews were held with representative members of sections of the Danish public over 13 years of age, covering 1391 persons. The main results of the investigations lead to the conclusions that most people are still interested in environmental problems, especially during 1992, but that the levels of both interest and knowledge have fallen in comparison to those of 1990 and are now overshadowed by problems of unemployment. The Danish people as represented by those interviewed do not feel that the debate on environmental pollution is exaggerated. Attention is given to the fact that some people feel that it is. Levels of interest do not vary from one region to the other. The 'Green' debate has passed its peak but interest in the subject is perhaps higher now than it was before this debate was most concentrated. It is concluded that most Danish people have integrated their desire for environmental

quality in their daily lives so that consideration for pollution abatement is taken habitually and actively. The remaining main results of the investigation are described. (AB)

2940 Fossil Fuels

Refer also to citation(s) 42, 46, 47, 93, 98, 100, 102, 103, 112, 730, 927, 972, 986, 987, 1019

980 (DOE/EIA–0380(94/10)) **Petroleum marketing monthly, with data for July 1994, October 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Oil and Gas. Oct 1994. 197p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001555. Source: OSTI; NTIS; GPO Dep.

The Petroleum Marketing Monthly (PMM) provides information and statistical data on a variety of crude oils and refined petroleum products. The publication presents statistics on crude oil costs and refined petroleum products sales for use by industry, government, private sector analysts, educational institutions, and consumers. Data on crude oil include the domestic first purchase price, the f.o.b. and landed cost of imported crude oil, and the refiners' acquisition cost of crude oil. Refined petroleum product sale data include motor gasoline, distillates, residual, aviation fuels, kerosene, and propane. The Petroleum Marketing Division, Office of Oil and Gas, Energy Information Administration ensures the accuracy, quality, and confidentiality of the published data in the Petroleum Marketing Monthly.

981 (DOE/FE–0320) **Strategic petroleum reserve: Quarterly report, August 15, 1994.** USDOE Assistant Secretary for Fossil Energy, Washington, DC (United States). Office of Strategic Petroleum Reserve. 15 Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002272. Source: OSTI; NTIS; GPO Dep.

The Strategic Petroleum Reserve serves as one of the most important investments in reducing the Nation's vulnerability to oil supply disruptions. Its existence provides an effective response mechanism should a disruption occur and a formidable deterrent to the use of oil as a political instrument. The Strategic Petroleum Reserve was created pursuant to the Energy Policy and Conservation Act of December 22, 1975 (Public Law 94-163), as amended, to reduce the impact of disruptions in supplies of petroleum products and to carry out obligations of the US under the Agreement on an International Energy Program. Section 165(a) of the Act requires the submission of Annual Reports and Section 165(b)(1) requires the submission of Quarterly Reports. This Quarterly Report highlights activities undertaken during the second quarter of calendar year 1994, including: inventory of petroleum products stored in the Reserve, under contract and in transit at the end of the calendar quarter; fill rate for the current quarter and projected fill rate for the next calendar quarter; average price of the petroleum products acquired during the calendar quarter; current and projected storage capacity; analysis of existing or anticipated problems with the acquisition and storage of petroleum products, and future expansion of storage capacity; funds obligated by the Secretary from the SPR Petroleum Account and the Strategic Petroleum Reserve Account during the prior calendar quarter and in total; and major environmental actions completed, in progress, or anticipated.

982 (ETDE/DE-mf–95708793) **Coal pricing in a centrally controlled, planned economy - the example of the People's Republic of China.** Intertechnik, v. 32. Liu Manhui. Forschungsinstitut fuer Internationale Technische und Wirtschaftliche Zusammenarbeit, Aachen (Germany). 1992. 131p. (In German). Order Number DE95708793. Source: OSTI; NTIS (US Sales Only).

This booklet attempts to describe the essential problem of coal pricing in China and uses these analyses to develop a system for coal pricing in the future. The first chapter contains an analysis of the present state of development of Chinese coal mining. The second chapter looks at the boundary conditions which applied to coal pricing in the centrally planned and steered economy of China, and the third chapter looks at the pricing process itself. The forth chapter contains an analysis of the cost of coal mining which is the basis for determining the fixed prices. The fifth chapter deals with the most important problem of the coal price system used up to now. Solutions to these problems are looked at in the sixth chapter which puts the emphasis of developing a new price model. The booklet is based mainly of official Chinese statistics and on books, technical journals and magazines and daily papers from the People's Republic of China. (orig./UA)

983 (ETDE/DE-mf–95716175) **Annual report 1993 of the German Gas and Water Supply Association (DVGW).** Deutscher Verein des Gas- und Wasserfaches e.V., Eschborn (Germany). 1994. 129p. (In German). Order Number DE95716175. Source: OSTI; NTIS (US Sales Only).

The tasks of the German Gas and Water Supply Association include the following: Establishing rules and standards at the national and European level, testing and approval of products, persons and firms, research and development at the Karlsruhe research agency of DVGW, training and continuation training of technical personnel and executives, technical information and counselling, cooperation within the International Gas Union (IGU). This publication reports on the tasks and organization of the association. The annual statement of accounts 1993 lays open numerous financial data. (UA)

984 (ETDE/DE-mf–95716314) **Institute for Petroleum Research. Annual report 1992.** Institut fuer Erdoelforschung, Clausthal-Zellerfeld (Germany). 1993. 104p. (In German). Order Number DE95716314. Source: OSTI; NTIS (US Sales Only).

After a summary of the most important results of the research programmes. Short descriptions are given of the separate research work areas: crude oil, natural gas and analysis. The report also includes information about personnel, budgets, international activities, services, publications and lectures. (UA)

2960 Electric Power

Refer also to citation(s) 923

985 (ANL/DIS/CP–84102) **The role of DSM in a competitive market.** Sutherland, R.J. Argonne National Lab., IL (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9409233–1: Biennial regulatory information conference, Columbus, OH (United States), 7 Sep 1994). Order Number DE95001098. Source: OSTI; NTIS; GPO Dep.

The author appreciates the opportunity to participate in this NARUC conference and to offer some thoughts on the implications for demand side management (DSM) resulting from increased competition in the electricity and gas businesses. The dominant theme of almost every professional conference in both gas and electricity is that the markets are becoming increasingly competitive and furthermore that increased competition benefits customers and affords opportunities to providers of energy services. However, only part of the effects of increased competition occur through utility DSM programs. A competitive marketplace for electricity and gas would indeed have an effect on utility conservation programs and on utility customers. The following are some of the implications of a competitive market. My presentation is an explanation and defense of these five propositions. (1) Economic efficiency will be enhanced - which increases the level of economic well being of customers and increases the productivity of the U. S. economy. (2) Energy efficiency will decrease, which may also increase our level of economic well-being and economic productivity. (3) Some DSM conservation programs will end, because they fail to pass the market test of competition. Those DSM programs that contribute to the efficient use of energy resources will prosper under competition. (4) The economic well-being of lower and middle income customers will be enhanced, first, by abolishing the DSM based subsidies to high income customers and second by pricing separately the reliability of electric services. (5) Policy goals will have to be justified on their merits - which is the worst fear of some, but the best outcome as viewed by others.

986 (DOE/EIA–0226(94/10)) **Electric power monthly, October 1994.** USDOE Energy Information Administration, Washington, DC (United States). Office of Coal, Nuclear, Electric and

Alternate Fuels. 21 Oct 1994. 190p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002520. Source: OSTI; NTIS; GPO Dep.

The Electric Power Monthly (EPM) presents monthly electricity statistics. The purpose of this publication is to provide energy decisionmakers with accurate and timely information that may be used in forming various perspectives on electric issues that lie ahead. Data in this report are presented for a wide audience including Congress, Federal and State agencies, the electric utility industry, and the general public.

987 (ETDE/DE-mf–95711698) **Vereinigte Elektrizitaetswerke Westfalen (VEW). Annual report 1992.** Vereinigte Elektrizitaetswerke Westfalen AG (VEW), Dortmund (Germany). 1993. 92p. (In German). Order Number DE95711698. Source: OSTI; NTIS (US Sales Only).

The tasks and activities of this big German affiliated company of the electric power industry are reviewed, including many financial data (e.g. balance sheet, profit- and loss account, etc.). The company constructs, buys and operates power plants for the generation, transport and supply of electric power, gas, or district heat. (UA)

988 (ETDE/DE-mf–95716229) **Bayernwerk AG. Report on the 73rd business year from October 1, 1992 to September 30, 1993.** Bayernwerk AG, Muenchen (Germany). 1993. 78p. (In German). Order Number DE95716229. Source: OSTI; NTIS (US Sales Only).

The tasks and activities of this electric utility are outlined including many financial data (balance sheet, profit-and-loss account, etc.). (UA)

989 (INIS-mf–15040) **Structure of the German electricity industry.** Strombasiswissen, v. 115. Informationszentrale der Elektrizitaetswirtschaft e.V. (IZE), Frankfurt am Main (Germany). Aug 1992. 8p. (In German). Order Number DE95711744. Source: OSTI; NTIS (US Sales Only); INIS.

The German integrated association is a union of those electric power supply utilities in the Federal Republic of Germany which cooperate in the integrated operation of 220 kV and 380 kV. The German integrated association (DVG) was founded in 1948. Its main task is to create the technical, operational and legal conditions for the cooperation in the national and international integrated system. The inclusion of the new Federal States has been practiced for the first time with the 320 MW power station in Offleben. (DG)

990 (LBL–34046) **Residential appliance data, assumptions and methodology for end-use forecasting with EPRI-REEPS 2.1.** Hwang, R.J.; Johnson, F.X.; Brown, R.E.; Hanford, J.W.; Kommey, J.G. Lawrence Berkeley Lab., CA (United States). May 1994. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94018541. Source: OSTI; NTIS; GPO Dep.

This report details the data, assumptions and methodology for end-use forecasting of appliance energy use in the US residential sector. Our analysis uses the modeling framework provided by the Appliance Model in the Residential End-Use Energy Planning System (REEPS), which was developed by the Electric Power Research Institute. In this modeling framework, appliances include essentially all residential end-uses other than space conditioning end-uses. We have defined a distinct appliance model for each end-use based on a common modeling framework provided in the REEPS software. This report details our development of the following appliance models: refrigerator, freezer, dryer, water heater, clothes washer, dishwasher, lighting, cooking and miscellaneous. Taken together, appliances account for approximately 70% of electricity consumption and 30% of natural gas consumption in the US residential sector. Appliances are thus important to those residential sector policies or programs aimed at improving the efficiency of electricity and natural gas consumption. This report is primarily methodological in nature, taking the reader through the entire process of developing the baseline for residential appliance end-uses. Analysis steps documented in this report include: gathering technology and market data for each appliance end-use and specific technologies within those end-uses, developing cost data for the various technologies, and specifying decision models to forecast future purchase decisions by households. Our implementation of the REEPS 2.1 modeling framework draws on the extensive technology, cost and market data assembled by LBL for the purpose of analyzing federal energy conservation standards. The resulting residential appliance forecasting model offers a flexible and accurate tool for analyzing the effect of policies at the national level.

991 (LBL–34243) **Technology data characterizing lighting in commercial buildings: Application to end-use forecasting with commend 4.0.** Sezgen, A.O.; Huang, Y.J.; Atkinson, B.A.; Eto, J.H.; Koomey, J.G. Lawrence Berkeley Lab., CA (United States). May 1994. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94018543. Source: OSTI; NTIS; GPO Dep.

End-use forecasting models typically utilize technology tradeoff curves to represent technology options available to consumers. A tradeoff curve, in general terms, is a functional form which relates efficiency to capital cost. Each end-use is modeled by a single tradeoff curve. This type of representation is satisfactory in the analysis of many policy options. On the other hand, for policies addressing individual technology options or groups of technology options, because individual technology options are accessible to the analyst, representation in such reduced form is not satisfactory. To address this and other analysis needs, the Electric Power Research Institute (EPRI) has enhanced its Commercial End-Use Planning System (COMMEND) to allow modeling of specific lighting and space conditioning (HVAC) technology options. This report characterizes the present commercial floorstock in terms of lighting technologies and develops cost-efficiency data for these lighting technologies. This report also characterizes the interactions between the lighting and space conditioning end uses in commercial buildings in the US In general, lighting energy reductions increase the heating and decrease the cooling requirements. The net change in a building's energy requirements, however, depends on the building characteristics, operating conditions, and the climate. Lighting/HVAC interactions data were generated through computer simulations using the DOE-2 building energy analysis program.

992 (LBL–35320) **The potential for reducing urban air temperatures and energy consumption through vegetative cooling.** Kurn, D.M.; Bretz, S.E.; Huang, B.; Akbari, H. Lawrence Berkeley Lab., CA (United States). May 1994. 25p. Sponsored by USDOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States);California Inst. for Energy Efficiency, Berkeley, CA (United States). DOE Contract AC03-76SF00098. Order Number DE94018534. Source: OSTI; NTIS; GPO Dep.

A network of 23 weather stations was used to detect existing oases in Southern California. Four stations, separated from one another by 15–25 miles (24–40 km), were closely examined. Data were strongly affected by the distance of the stations from the Pacific Ocean. This and other city-scale effects made the network inadequate for detection of urban oases. We also conducted traverse measurements of temperature and humidity in the Whittier Narrows Recreation Area in Los Angeles County on September 8–10, 1993. Near-surface air temperatures over vegetated areas were 1–2°C lower than background air temperatures. We estimate that vegetation may lower urban temperatures by 1°C, while the establishment of vegetative canopies may lower local temperatures by an additional 2°C. An increase in vegetation in residential neighborhoods may reduce peak loads in the Los Angeles area by 0.3 GW, and reduce energy consumption by 0.2 BkWh/year, saving $20 million annually. Large additional savings would result from regional cooling.

993 (NEDO-P–9332) **Field collection of information on Pacific energy policy (outline of electric power industry in China).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 241p. (In Japanese). Order Number DE95714823. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order for Japan to promote the technological cooperation for energy, information was put in order about the alternative energy to oil mainly in the field of electric power particularly in China and

Hong Kong. In China, all the cities under direct control of central government, provinces and autonomous regions have their respective characteristics which are strongly particular in nature, culture, society and economy, so that China can not be grasped by the same standard. Assuming that the GNP rises by 8 to 9%, the electric power demand in 2000 will be four times as large as that in 1980. There was a power shortage of 38.7 billion kWh even as of 1990. Being 180 million kW at the end of 1993, the power generation capacity will be, from now on, filled mainly by the coal burning, which will be supplemented with both hydraulic force and nuclear energy. To avoid the acid rainfall, the desulfurization of flue gas is needed in Sichuan and Guizhou Provinces. But, funds are short for it. For the monetary introduction from foreign countries, the power rates must be institutionally revised to meet the cost. Situation was compared between Guangdong Province representing the economic growth and Sichuan Province under development in economy. A detailed forecast was also made of the economy, electric power situation and development of alternative energy to oil in Hong Kong having no primary energy resources. 57 figs., 82 tabs.

994 (ORNL/CON–398) **IRP and the electricity industry of the future: Workshop results.** Tonn, B.; Hirst, E.; Bauer, D. Oak Ridge National Lab., TN (United States). Sep 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001500. Source: OSTI; NTIS; GPO Dep.

During the next several years, the U.S. electricity industry is likely to change dramatically. Instead of an industry dominated by vertically integrated companies that are regulated primarily by state public utility commissions, we may see an industry with many more participants and less regulation. These new participants may include independent power producers, entities that dispatch and control power plants on a real-time basis, entities that build and maintain transmission networks, entities that build and maintain distribution systems and also sell electricity and related to services to some retail customers, and a variety of other organizations that sell electricity and other services to retail customers. Because markets are intended to be the primary determinant of success, the role of state and federal regulators might be less than it has been in the past. During the past decade, utilities and state regulators have developed new ways to meet customer energy-service needs, called integrated resource planning (IRP). IRP provides substantial societal benefits through the consideration and acquisition of a broad array of resources, including renewables and demand-side management (DSM) programs as well as traditional power plants-, explicit consideration of the environmental effects of electricity production and transmission; public participation in utility planning; and attention to the uncertainties associated with different resources, future demands for electricity, and other factors. IRP might evolve in different ways as the electricity industry is restructured (Table S-I). To explore these issues, we ran a Workshop on IRP and the Electricity Industry of the Future in July 1994. This report presents the wisdom and experience of the 30 workshop participants. To focus discussions, we created three scenarios to represent a few of the many ways that the electricity industry might develop.

995 (RISO-R–767(DA)) **ELSE - a model for forecasting electricity demand in the service sector: En prognosemodel for servicesektorens elforbrug.** Morthorst, P.E.; Praestegaard, S.; Andersen, F.M.; Schleisner, L.; Ingerslev, C.; Jacobsen, H.; Noergaard, R. Risoe National Lab., Roskilde (Denmark). Systems Analysis. Sep 1994. 113p. (In Danish). Order Number DE95707368. Source: OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark.

The main objective of the project was to analyze the development in electricity demand in the service sector, and using this as starting point to develop a model for forecasting and sensitivity analysis. The developed model, ELSE, combines the econometric top-down approach with the bottom-up approach, based on simulation techniques. The ELSE-model provides the possibility of evaluating the future electricity demand related to either economic assumptions (development in production, energy prices etc.) or to technical assumptions on penetration and efficiency improvements for end-use technologies. A baseline forecast can then be computed as a weighted average of the results of the two above-mentioned approaches. The report contains the econometric and technical analysis of the service branches, and the ELSE-model is described. The results are illustrated for a baseline forecast and a number of sensitivity analyses. Finally, the ELSE-model is implemented as a computational tool, making it easy to construct new baselines and perform sensitivity analysis. (au) (68 tabs., 55 ills., 20 refs.)

996 (WHC-SD-LL-RD–004) **Standardized equipment labeling program for electrical utilities.** Westinghouse Hanford Co., Richland, WA (United States). 19 Jul 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002460. Source: OSTI; NTIS; GPO Dep.

The purpose of this supporting document is to provide specific guidelines required for Electrical Utilities to implement and maintain a standard equipment and piping labeling program in accordance with WHC-SP-0708, Chapter 18, "Westinghouse Hanford Company Conduct of Operations Manual". Specific guidelines include definition of program responsibilities.

2980 Consumption and Utilization

Refer also to citation(s) 973, 974, 980

997 (ANL/ESD/TM–76) **Estimating household fuel oil/kerosine, natural gas, and LPG prices by census region.** Poyer, D.A.; Teotia, A.P.S. Argonne National Lab., IL (United States). Aug 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95002578. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this research is to estimate individual fuel prices within the residential sector. The data from four US Department of Energy, Energy Information Administration, residential energy consumption surveys were used to estimate the models. For a number of important fuel types - fuel oil, natural gas, and liquefied petroleum gas - the estimation presents a problem because these fuels are not used by all households. Estimates obtained by using only data in which observed fuel prices are present would be biased. A correction for this self-selection bias is needed for estimating prices of these fuels. A literature search identified no past studies on application of the selectivity model for estimating prices of residential fuel oil/kerosine, natural gas, and liquefied petroleum gas. This report describes selectivity models that utilize the Dubin/McFadden correction method for estimating prices of residential fuel oil/kerosine, natural gas, and liquefied petroleum gas in the Northeast, Midwest, South, and West census regions. Statistically significant explanatory variables are identified and discussed in each of the models. This new application of the selectivity model should be of interest to energy policy makers, researchers, and academicians.

998 (NEDO-P–9313) **Survey on the actual energy consumption status for the residential/economical use.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 207p. (In Japanese). Order Number DE95714817. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

Energy for the residential/commercial use was data-reduced through documentation of the past researches and surveyed by means of questionnaires on the actual status. In four surveyed regions, the unit energy consumption is 14.313Mcal/family · year as a simple average. By energy source, the kerosene which is the largest in unit consumption (with a constituent ratio of 53%) is followed by the electricity (23%), LPG (13%) and town gas (12%). By purpose of use, the air heating which is the largest in unit consumption (with a constituent ratio of 41%) is followed by the water heating (32%), lighting and use of electrical appliances (18%), cooking (9%) and air cooling (1%). As for the comparison in secular change in unit consumption among the four urban types different in scale, i.e., large cities, middle and small towns, and villages, the unit consumption decreases only in the small towns and increases in all the other three urban types, among which the large

towns give the highest increasing rate of 18.4%. The total of unit consumption surveyed in 1992 increased by 0.4% from that done in 1987. By energy source, the electricity and town gas increased in it, while by purpose of use, the air heating and cooling did in it. 46 refs., 158 figs., 49 tabs.

2990 Unconventional Sources and Power Generation

Refer also to citation(s) 927, 971, 1059, 1060

999 (ETDE/DE-mf–95716343) **Field testing programme for solar- and wind energy applications in developing countries (REBRA): Final report.** Biermann, E.; Posorski, R. Deutsche Gesellschaft fuer Technische Zusammenarbeit GmbH (GTZ), Eschborn (Germany). Dec 1991. 9p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0329051A. Order Number DE95716343. Source: OSTI; NTIS (US Sales Only).

In developing countries with a good solar- or windpotential the solar/windtechnology offers new attractive solutions for energy supply especially in rural areas. The GTZ was commissioned to develop a conceptual approach for an international field testing programme. The concept supports the demonstration of selected technologies as well as the information exchange from the demand side to the suppliers of solar- and windtechnologies and vice versa. A study on training requirements for an international programme was performed. The results were considered within the planning phase of the EL DORADO Programme. (orig.). 3 refs.

1000 (NEDO-P–9358) **Possibility of introducing new energy technologies to the South Pacific island countries.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 172p. (In Japanese). Order Number DE95714818. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The South Pacific countries lie on some hundreds of isolated islands inhabited by six million persons who live by subsistence agriculture and fishing. For the regional development in those countries, research was made on the possibility of introducing new energy technologies there. The region is composed of mountainous islands which are rich in land and marine resources, mixed groups of volcanic islands and atoll islands, and groups of infertile atoll islands without land-based resources. Agriwaste and wood are the main fuels for domestic purposes and process heating in industry, plus some electricity generation. Hydraulic potential in the mountainous regions already supplies most grid electricity in Papua New Guinea and Fiji. Solar energy is used for the crop drying and domestic hot water supply. To promote more use of the above indigenous energy resources, many aid-funded projects so far executed gave variously mixed results. The projects based on the hydraulic potential and solar energy were executed satisfactorily but at a high cost. The gasification is not applied yet to the biomass combustion. Measures on a region-by-region basis must be taken because of chronic shortage of technical skills, and major economic and cultural barriers.

1001 (NREL/TP–442-7227) **Village power hybrid systems development in the United States.** Flowers, L. (National Renewable Energy Lab., Golden, CO (United States)); Green, J.; Bergey, M.; Lilley, A.; Mott, L. National Renewable Energy Lab., Golden, CO (United States). Nov 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-941050–1: European Wind Energy Association conference and exhibition, Thessaloniki (Greece), 10-14 Oct 1994). Order Number DE95000247. Source: OSTI; NTIS; GPO Dep.

The energy demand in developing countries is growing at a rate seven times that of the OECD countries, even though there are still 2 billion people living in developing countries without electricity. Many developing countries have social and economic development programs aimed at stemming the massive migration from the rural communities to the overcrowded, environmentally problematic, unemployment-bound urban centers. To address the issue of providing social, educational, health, and economic benefits to the rural communities of the developing world, a number of government and nongovernment agencies are sponsoring pilot programs to install and evaluate renewable energy systems as alternatives to line extension, diesels, kerosene, and batteries. The use of renewables in remote villages has yielded mixed results over the last 20 years. However, recently, photovoltaics, small wind turbines, and microhydro system shave gained increasing recognition as reliable, cost-effective alternatives to grid extension and diesel gensets for village-electricity applications. At the same time, hybrid systems based on combinations of PV/wind/batteries/diesel gensets have proven reliable and economic for remote international telecommunications markets. With the growing emphasis on environmentally and economically sustainable development of international rural communities, the US hybrid industry is responding with the development and demonstration of hybrid systems and architectures that will directly compete with conventional alternatives for village electrification. Assisting the US industry in this development, the National Renewable Energy Laboratory (NREL) has embarked on a program of collaborative technology development and technical assistance in the area of hybrid systems for village power. Following a brief review of village-power hybrid systems application and design issues, this paper presents the present industry development activities of three US suppliers and the NREL.

30 DIRECT ENERGY CONVERSION

3001 MHD Generators

Refer also to citation(s) 2430

3003 Thermoelectric Generators

1002 (LA-UR–94-1938) **Conceptual design of an RTG Facility Transportation System.** Black, S.J.; Gentzlinger, R.C.; Lujan, R.E. Los Alamos National Lab., NM (United States). 3 Jun 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950110–1: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE94014443. Source: OSTI; NTIS; INIS; GPO Dep.

The conceptual design of an Radioisotope Thermoelectric Generator (RTG) Facility Transportation System which is part of the overall RTG Transportation System has been completed and is described in detail. The Facility Transportation System serves to provide locomotion, cooling, shock protection and data acquisition for the RTG package during loading and unloading sequences. The RTG Facility Transportation System consists of a Transporter Subsystem, a Package Cooling Subsystem, and a Shock Limiting Transit Device Subsystem. The Transporter Subsystem is a uniquely designed welded steel cart combined with a pneumatically-driven hand tug for locomotion. The Package Cooling Subsystem provides five kilowatts of active liquid cooling via an on-board refrigeration system. The Shock limiting Transit Device Subsystem consists of a consumable honeycomb transit frame which provides shock protection for the 3855 kg (8500 LB) RTG package. These subsystems have been combined into an integrated system which will facilitate the unloading and loading of the RTG , of the Transport Trailer as well as meet ALARA radiation Package into and out exposure guidelines.

1003 (NEDO-P–9323) **Research on the power generation system with thermoelectric conversion elements.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 119p. (In Japanese). Order Number DE95714804. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The semiconductor thermoelectric power generation system was conceptually designed which utilized, as a case study, a high temperature exhaust heat of 2000kWth from 10MW phosphoric acid fuel cells. Technical problems were then raised to put it to practical use. A system in which the thermoelectric power generation was applied to the heat exchanger of high temperature exhaust water

was structured, because the high temperature exhaust heat had to be utilized without thermally unbalancing the fuel cell system. Through studying the influence to be given to the power generation performance by the configuration of module with Bi-Te elements, it was indicated that the present element performance generates the power of about 100kW, which corresponds to the net power of about 80kW with a deduction of pumping power. Not only the element performance enhancement, but also it is indispensable to evaluate and demonstrate the reliability which is viewed from the thermomechanical point in the module joining and other thermoelectric power generation parts, and from the point of thermal resistance and other power generation performance in the members and pressure-welded parts. It was pointed out that the system experiment is necessary on a small and medium scale. 54 refs., 97 figs., 26 tabs.

1004 (UCRL-JC–117602) **Sputter deposition of multilayer thermoelectric films: An approach to the fabrication of two-dimensional quantum wells.** Farmer, J.C. (Lawrence Livermore National Lab., CA (United States)); Barbee, T.W. Jr.; Chapline, G.C. Jr.; Foreman, R.J.; Summers, L.J.; Dresselhaus, M.S.; Hicks, L.D. Lawrence Livermore National Lab., CA (United States). Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940830–2: 13. international conference on thermoelectrics, Kansas City, MO (United States), 30 Aug - 1 sep 1994). Order Number DE95002396. Source: OSTI; NTIS; GPO Dep.

The relative efficiency of a thermoelectric material is measured in terms of a dimensionless figure of merit, ZT. Though all known thermoelectric materials are believed to have $ZT \leq 1$, recent theoretical results predict that thermoelectric devices fabricated as two-dimensional quantum wells (2D QWs) or onedimensional (1D) quantum wires could have $ZT \geq 3$. Multilayers with the dimensions of 2D QWs have been synthesized by alternately sputtering $Bi_{0.9}Sb_{0.1}$ and $PbTe_{0.8}Se_{0.2}$ onto a moving single-crystal sapphire substrate from dual magnetrons. These materials have been used to test the thermoelectric quantum-well concept and gain insight into relevant transport mechanisms. If successful, this research could lead to thermoelectric devices that have efficiencies close to that of an ideal Carnot engine. Ultimately, such devices could be used to replace conventional heat engines and mechanical refrigeration systems.

1005 (WHC-SA–2489) **Radioisotope Thermoelectric Generator Package O-Ring Seal Material Validation Testing.** Adkins, H.E.; Ferrell, P.C.; Knight, R.C. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950110–5: 12. symposium on space nuclear power and propulsion, Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95001295. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioisotope Thermoelectric Generator Package O-Ring Seal Material Validation Test was conducted to validate the use of the Butyl material as a primary seal throughout the required temperature range. Three tests were performed at (1) 233 K (−40 °F), (2) a specified operating temperature, and (3) 244 K (−20 °F) before returning to room temperature. Helium leak tests were performed at each test point to determine seal performance. The two major test objectives were to establish that butyl rubber material would maintain its integrity under various conditions and within specified parameters and to evaluate changes in material properties.

3004 Thermionic Converters

Refer also to citation(s) 792

3005 Fuel Cells

Refer also to citation(s) 896, 897, 929, 1003

1006 (ANL/CMT/CP–84205) **A fuel cell overview.** Krumpelt, M. (Argonne National Lab., IL (United States)); Reiser, C. Argonne National Lab., IL (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410217–1: Northeast Sustainable Energy Association (NESEA) symposium, Providence, RI (United States), 3-5 Oct 1994). Order Number DE95001455. Source: OSTI; NTIS; GPO Dep.

This paper is an overview of the fuel cell as an efficient and environmentally benign energy conversion technology. The topics of the paper include their physical arrangement, types of fuel cells, status of commercial development, applications of the fuel cell power plants and comparison with existing alternatives, and good design practice for fuel cell safety.

1007 (DOE/MC/26006–3300) **Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly technical status report, April–June, 1992.** Allied-Signal Aerospace Co., Torrance, CA (United States). AiResearch Los Angeles Div. 16 Nov 1992. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26006. Order Number DE95003104. Source: OSTI; NTIS; GPO Dep.

The objective of the program is to advance materials and fabrication methodologies to develop a monolithic solid oxide fuel cell (MSOFC) system capable of meeting performance, life, and cost goals for coal-based power generation. The program focuses on materials research and development, fabrication process development, cell/stack performance testing and characterization, cost and system analysis, and quality development. An introductory section describes the design features of the MSOFC. The remainder of the report discusses the progress made in four of the six main tasks of this project: Materials research and development; Fabrication; Testing on coal gas; and Quality development.

1008 (DOE/MC/26006–3804) **Performance and cost analysis of monolithic solid oxide fuel cells.** Department of Energy, Morgantown, WV (United States). Morgantown Energy Technology Center. Mar 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26006. Order Number DE95002511. Source: OSTI; NTIS; GPO Dep.

This report was prepare by AlliedSignal Aerospace Systems & Equipment (ASE) in partial fulfillment of the statement of work (SOW) for Contract DE-AC21-89MC26006, specifically, item 3, "Task 5 - Topical Report" of Section C, "Deliverables." It comprises an evaluation and optimization of a 2-Mwe monolithic solid oxide fuel (MSOFC) system operating on natural gas fuel, and an update of the stack manufacturing costs developed under Contract DE-AC21-88MC25166. The system studies are supported by the stack performance model FCELL developed under "Task 5.1 - Stack Performance Studies." The system studies show a clear advantage of stacks that are sealed vs. the current "seal-less" approaches; the sealed stacks achieve extraordinarily high system efficiencies. A market survey supplemented by key inputs from DOE/METC and EPRI personnel led to the power level and fuel selections.

1009 (DOE/MC/26006–3900) **Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly status report, July–September 1993.** Allied-Signal Aerospace Co., Torrance, CA (United States). Oct 1993. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26006. Order Number DE95002506. Source: OSTI; NTIS; GPO Dep.

Objective is to advance materials and fabrication methodologies to develop a MSOFC system capable of meeting performance, life, and cost goals for coal-based power generation. This document is divided into: introduction, background on MSOFCs (design concept and features), material development (electrolyte mechanical properties, sealant development), fabrication (anode, manifolding, stack assembly), and performance testing (single cell, stack). 17 figs.

1010 (DOE/MC/26006–3901) **Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly status report, April 1993–June 1993.** Allied-Signal Aerospace Co., Torrance, CA (United States). Jul 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-89MC26006. Order Number DE95002508. Source: OSTI; NTIS; GPO Dep.

This report describes the work performed under Contract DE-AC21-89MC26006, for the U.S. Department of Energy (DOE)/ Morgantown Energy Technology Center (METC) program. The report covers the period April through June 1993. The program is

conducted by a team consisting of AlliedSignal Aerospace Systems & Equipment (ASE), Argonne National Laboratory (ANL), and AlliedSignal Research & Technology. The objective of the program is to advance materials and fabrication methodologies to develop a monolithic solid oxide fuel cell (MSOFC) system capable of meeting performance, life, and cost goals for coal-based power generation. The program focuses on materials research and development, fabrication process development, cell/stack performance testing and characterization, cost and system analysis, and quality development.

1011 (DOE/MC/28065–3880) **Molten carbonate fuel cell product development test: Annual report, October 1992–September 1993.** M-C Power Corp., Burr Ridge, IL (United States). Dec 1993. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28065. Order Number DE95000005. Source: OSTI; NTIS; GPO Dep.

Advanced fuel cell active components have been developed and scaled up from laboratory scale to commercial scale. Full width components of both the stabilized nickel cathodes and the low chrome anodes have been successfully cast on M-C Power's production tape caster. An improved design for a fuel cell separator plate has been developed. The improved design meets the goals of lower cost and manufacturing simplicity, and addresses performance issues of the current commercial area plate. The engineering that the Bechtel Corporation has completed for the MCFC power plant includes a site design, a preliminary site layout, a Process Flow Diagram, and specification for the procurement of some of the major equipment items. Raw materials for anode and cathode components were ordered and received during the first half of 1993. Tape casting of anodes was started in late summer and continued through August. In addition to the technical progress mentioned above, an environment assessment was prepared in compliance with the National Environmental Policy Act of 1969 (NEPA). As a result, the PDT has received a categorical exclusion from the Air Pollution Control District permit requirements. The PDT is configured to demonstrate the viability of natural gas-fueled MCFC for the production of electricity and thermal energy in an environmentally benign manner for use in commercial and industrial applications.

1012 (DOE/METC/C–95/7162) **Solid oxide fuel cells in the United States.** Hooie, D.T. USDOE Morgantown Energy Technology Center, WV (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). (CONF-9410170–1: 1. European solid oxide fuel cell forum: engineering, systems, applications, Lucerne (Switzerland), 3-7 Oct 1994). Order Number DE95002405. Source: OSTI; NTIS; GPO Dep.

This paper presents an overview of the solid-oxide fuel cell program being undertaken in the US. This program addresses both intermediate and high temperature fuel cells as well as a variety of configurations including planar/monolithic, and tubular. These projects also address a variety of issues such as material compatibility, life/degradation, fuel compatibility, and system scaleup and integration. The primary applications currently being developed is for power generation but a variety of other potential applications, such as transportation, are being considered. The funding for these projects is provided through a variety of sources including the US Government (primarily Departments of Energy, Transportation, and Defense), the Electric Power Research Institute (EPRI), the Gas Research Institute (GRI), and industry.

32 ENERGY CONSERVATION, CONSUMPTION, AND UTILIZATION

3201 Buildings

Refer also to citation(s) 699, 990, 991, 1707

1013 (BNL–60930) **Estimating the impacts of federal efforts to improve energy efficiency: The case of buildings.** LaMontagne, J. (Brookhaven National Lab., Upton, NY (United States). Energy Efficiency and Conservation Div.); Jones, R.; Nicholls, A.; Shankle, S. Brookhaven National Lab., Upton, NY (United States). Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941187–1: 16. North American conference: the world oil and gas industries in the 21st century, Dallas, TX (United States), 6-9 Nov 1994). Order Number DE95002223. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy's Office of Energy Efficiency and Renewable Energy (EE) has for more than a decade focused its efforts on research to develop new technologies for improving the efficiency of energy use and increasing the role of renewable energy; success has usually been measured in term of energy saved or displaced. Estimates of future energy savings remain an important factor in program planning and prioritization. A variety of internal and external factors are now radically changing the planning process, and in turn the composition and thrust of the EE program. The Energy Policy Act of 1992, the Framework Convention on Climate Change (and the Administration's Climate Change Action Plan), and concerns for the future of the economy (especially employment and international competitiveness) are increasing emphasis on technology deployment and near-term results. The Reinventing Government Initiative, the Government Performance and Results Act, and the Executive Order on Environmental Justice are all forcing Federal programs to demonstrate that they are producing desired results in a cost-effective manner. The application of Total Quality management principles has increased the scope and importance of producing quantified measures of benefit. EE has established a process for estimating the benefits of DOE's energy efficiency and renewable energy programs called "Quality Metrics" (QM). The "metrics" are: energy, employment, equity, environment, risk, economics. This paper describes the approach taken by EE's Office of Building Technologies to prepare estimates of program benefits in terms of these metrics, presents the estimates, discusses their implications, and explores possible improvements to the QM process as it is currently configured.

1014 (CONF-9109397–1) **A self-adjusting combustion control system for low-capacity oil-fired heating systems.** Pfannstiel, D.; Isermann, R. Technische Hochschule Darmstadt (Germany). Inst. fuer Regelungstechnik; Viessmann KG, Allendorf (Germany). [1991]. 15p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328685A. From GET/ETG meeting on combustion and heating - 15th German flame day; Bochum (Germany); 17-18 Sep 1991. Order Number DE95708622. Source: OSTI; NTIS (US Sales Only).

This article describes the design and testing of a combustion control system for an oil combustion with a small output. The control parameter is the quantity of combustion air for combustion, which is adjusted via an air flap. From a mathematical model for the combustion control zone developed first, the control algorithm was able to be optimized with the aid of a computer. The developed combustion control system can easily be adapted to other boiler pararameters and types of boilers. (orig./HW)

1015 (CONF-950104–1) **Simulation and performance analysis of a quadruple-effect lithium bromide-water absorption.** Grossman, G. (Technion-Israel Inst. of Tech., Haifa (Israel). Faculty of Mechanical Engineering); Zaltash, A.; DeVault, R.C. Oak Ridge National Lab., TN (United States). Apr 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Society of Heating, Refrigerating and Air-Conditioning Engineers winter meeting and exhibition; Chicago, IL (United States); 28 Jan - 1 feb 1995. Order Number DE94017876. Source: OSTI; NTIS; GPO Dep.

In order to investigate the possibility of improving utilization of high temperature heat sources, such as natural gas, for absorption chillers, performance simulation has been conducted for a quadruple-effect lithium bromide-water cycle, capable of substantial performance improvement over state-of-the-art double-effect cycles. The system investigated includes four condensers and four desorbers coupled together, forming an extension of the conventional double-effect cycle; based on prior experience, a parallel flow system was perferred over series flow, and double-condenser coupling (DCC) was employed, extending from triple-effect cycles, to further improve performance. A modular computer code for simulation of

absorption systems (ABSIM) was used to investigate the performances of the cycle. The simulation was carried out over a range of operating conditions, including investigation of the influence of some major design parameters. A coefficient of performance in the neighborhood of 2.0 (cooling) was calculated at the design point, with a heat supply temperature of 600°F at the solution outlet from the high temperature desorber. With some optimization of the weak (pumped) solution flowrate and of the solution split among the four desorbers, this COP may be raised above 2.2, without any increase in the heat transfer surface of the system's components.

1016 (DOE/CE/15557–T4) **Prototype testing of Branched GAX air conditioning cycle: Third quarterly report, 1994.** Energy Concepts Co., Annapolis, MD (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93CE15557. Order Number DE95001150. Source: OSTI; NTIS; GPO Dep.

The design and construction of the new Branched GAX prototype is in progress. The new design is based on the lessons learned during the operation of the first Branched GAX prototype and also a basic GAX prototype. The first Branched GAX prototype was built before the initiation of this project, with standard off-the-shelf components and shell and tube heat exchanger design. The performance of the prototype was well below the theoretical limits. Alternate component designs were tested as part of a parallel project on a 5 refrigeration ton basic GAX prototype. The lessons of those two prototypes are directly applicable to the Branched GAX project and are being incorporated into the current design. To facilitate design and construction and to provide a common reference point for comparison with the basic GAX prototype, the new Branched GAX prototype is being designed for a 5 refrigeration ton capacity. The design effort is now nearing completion, and component construction is underway.

1017 (DTH-LBM-TR–94-297) **The Re-used House - energy analysis of the production: An evaluation of the difference in energy consumption in connection with the re-used house and a conventional building.** Rasch, L.; Holleris Petersen, E.; Nielsen, A. Danmarks Tekniske Hoejskole, Lyngby (Denmark). Lab. for Bygningsmaterialer. Jan 1994. 42p. (In Danish). Order Number DE95707362. Source: OSTI; NTIS.

The aim was to evaluate the advantages related to resources and to the environment in connection with the Danish-produced re-used house (a house built of materials from demolished buildings) compared to a conventional house of the same design but built of new materials. Materials used in both the houses are surveyed and compared with regard to energy consumption seen in relation to processing and transport etc. The results are presented in detail. It was concluded that the re-use of tiles resulted in the greatest saving of energy. (AB) (27 refs.)

1018 (ETDE/DE-mf–95708674) **Windows of wood, plastic or aluminium: Material and design requirements, advice for tender, construction management and takeover.** Landesinstitut fuer Bauwesen und Angewandte Bauschadensforschung NRW, v. 2.13-1991. Freie und Hansestadt Hamburg (Germany). Baubehoerde; Landesinstitut fuer Bauwesen nd Angewandte Bauschadensforschung (LBB), Aachen (Germany). 1991. 79p. (In German). Order Number DE95708674. Source: OSTI; NTIS (US Sales Only).

In this planning information among others essential features of high-quality windows are described following the RAL quality standard and advice is given for tender action, installation and takeover. In this connection the following subjects are dealt with: Window requirements, wood, aluminium and aluminium-wood windows, aluminium window systems, rigid PVC windows, windows of rigid expanded integral skin PUR foam, window distribution, opening variants, accessories, building requirements, ventilation, connection to the building, glazing, surface protection, cleaning, quality assessment as well as maintenance. (BWI)

1019 (ETDE/DE-mf–95716297) **Raw material conservation report of Lower Saxony 1993.** Niedersaechsisches Landesamt fuer Bodenforschung, Hannover (Germany). [1993]. 60p. (In German). Order Number DE95716297. Source: OSTI; NTIS (US Sales Only).

With 1 separate map in annex.

The raw material conservation report 1993 goes in the first part into a subject of topical importance, the material demand for housing. This is followed by an analysis about the replacement of natural raw materials by rubble and old paving material. Last analysis results of the raw material economy of Lower Saxony are in the focus of the report: production, consumption, substitution, recycling as well as the most important problems in the exploitation of surface-near raw materials. Moreover connections are gone into resulting in border areas from the exploration of deposits on both sides of the border. For the explanation of bases of working methods the drawing up of a map of surface-near deposits is described. The report shows impacts resulting from increased building and the growing together of economic areas in the course of the German unification. One result is the since 1988 increased consumption of sand, gravel, tiles and lime by 10 to 15%. Also the power demand based on the use of Helmstedt brown coal has increased to the same extent in the new Federal States. (orig.)

1020 (LBL–34123) **Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0.** Sezgen, A.O.; Franconi, E.M.; Greenberg, S.E.; Koomey, J.G.; Akbari, H. Lawrence Berkeley Lab., CA (United States). May 1994. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002647. Source: OSTI; NTIS; GPO Dep.

This report characterizes the present commercial floorstock for offices in terms of space-conditioning technologies and develops cost-efficiency data for these technologies. The report also characterizes the annual and peak space-conditioning requirements for the building stock. The representation of space conditioning end uses is complicated by several factors. First, the number of configurations of HVAC systems and heating and cooling plants is very large. Second, the properties of the building envelope are an integral part of the energy consumption characteristics of the building. Electric Power Research Institute's (EPRI's) Commercial End-Use Planning System (COMMEND 4.0) and the associated data development presented in this report attempt to tackle the above complications and create a consistent forecasting framework. Data in this report come from various sources including the U.S. Department of Energy (DOE), EPRI, and LBL publications. Other sources include cost-estimation publications used in industry. Prototype simulations using the DOE-2 building energy analysis program were used for the generation of data related to the efficiencies of shell measures, HVAC systems and utilization systems (controls and economizers).

1021 (LBL–34458) **The design and evaluation of three advanced daylighting systems: Light shelves, light pipes and skylights.** Beltran, L.O.; Lee, E.S.; Papmichael, K.M.; Selkowitz, S.E. Lawrence Berkeley Lab., CA (United States). Mar 1994. 7p. Sponsored by USDOE, Washington, DC (United States);California Inst. for Energy Efficiency, Berkeley, CA (United States). DOE Contract AC03-76SF00098. (CONF-9406134–4: SOLAR '94: American Solar Energy Society conference, San Jose, CA (United States), 25-30 Jun 1994). Order Number DE94018194. Source: OSTI; NTIS; GPO Dep.

We present results from the design and evaluation of three advanced daylighting systems: a light shelf, a light pipe, and a skylight. These systems use optical films and an optimized geometry to passively intercept and redirect sunlight further into the building. The objectives of these designs are to increase daylighting illuminance levels at distances of 4.6-9.1 m (15–30 ft) from the window, and to improve the uniformity of the daylight distribution and the luminance gradient across the room under variable sun and sky conditions throughout the year. The designs were developed through a series of computer-assisted ray-tracing studies, photometric measurements, and observations using physical scale models. Comprehensive sets of laboratory measurements in combination with analytical routines were then used to simulate daylight performance for any solar position. Results show increased daylight levels and an improved luminance gradient throughout the year – indicating that lighting energy consumption and cooling

energy due of lighting can be substantially reduced with improvements to visual comfort. Future development of the designs may further improve the daylighting performance of these systems.

1022 (LBL–34716) **A new method for predicting the solar heat gain of complex fenestration systems: II, Detailed description of the matrix layer calculation.** Klems, J.H. Lawrence Berkeley Lab., CA (United States). Oct 1993. 29p. Sponsored by USDOE, Washington, DC (United States);American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Atlanta, GA (United States). DOE Contract AC03-76SF00098. Project 548-RP. (CONF-940104–12-Pt.2: Winter meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), New Orleans, LA (United States), 22-26 Jan 1994). Order Number DE94018196. Source: OSTI; NTIS; GPO Dep.

A new method of predicting the solar heat gain through complex fenestration systems involving nonspecular layers such as shades or blinds has been examined in a project jointly sponsored by ASHRAE and DOE. In this method, a scanning radiometer is used to measure the bidirectional radiative transmittance and reflectance of each layer of a fenestration system. The properties of systems containing these layers are then built up computationally from the measured layer properties using a transmission/multiple-reflection calculation. The calculation produces the total directional-hemispherical transmittance of the fenestration system and the layer-by-layer absorptances. These properties are in turn combined with layer-specific measurements of the inward-flowing fractions of absorbed solar energy to produce the overall solar heat gain coefficient. A preceding paper outlined the method and provided the physical derivation of the calculation. In this second of a series of related papers the detailed development of the matrix layer calculation is presented.

1023 (LBL–35240) **Energy Analysis Program, 1993 annual report.** Lawrence Berkeley Lab., CA (United States). Jun 1994. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002648. Source: OSTI; NTIS; GPO Dep.

With the new federal Administration in place, we have observed increasing attention in the areas of research and analysis that have been central to our interests. Energy efficiency is once again a very high priority in the national agenda. This increased emphasis on energy efficiency was already apparent prior to the national elections in the contents of the National Energy Policy Act (EPACT), passed by Congress in 1992. The Climate Change Action Plan, released by the White House in October 1993, strengthens the federal government's leadership role in the design and implementation of energy-efficiency programs. Budget submissions show energy efficiency and renewable energy programs among the relatively small number of discretionary programs at the federal level that are expected to receive large percentage increases.

1024 (LBL–35241) **Indoor Environment Program, 1993 annual report.** Lawrence Berkeley Lab., CA (United States). Jun 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002649. Source: OSTI; NTIS; GPO Dep.

The Indoor Environment Program in LBL's Energy and Environment Division was established in 1977 to conduct integrated research on ventilation, indoor air quality and energy use and efficiency in buildings for the purpose of increasing energy efficiency in buildings while maintaining or improving occupant health and comfort. Research is conducted on buildings energy use and efficiency, ventilation and infiltration, and thermal distribution systems; on the nature, sources, transport, transformation and deposition of indoor air pollutants; and on exposure and health risk associated with indoor air pollutants. Pollutants of particular interest include radon; volatile, semivolatile and particulate organic compounds; and combustion emissions, including environmental tobacco smoke, CO and NOx.

1025 (LBL–35244) **Building Technologies Program, 1993 annual report.** Lawrence Berkeley Lab., CA (United States). Jun 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002650. Source: OSTI; NTIS; GPO Dep.

The objective of the Building Technologies Program is to assist the US building industry in achieving substantial reductions in building-sector energy use and associated greenhouse gas emissions while improving the comfort, amenity, health, and productivity in the building sector. We focus our efforts on two major building systems - windows and lighting - and the simulation tools needed by researchers and designers to integrate the full range of energy efficiency solutions into achievable, cost-effective design solutions for new and existing buildings.

1026 (LBL–36134) **Optimizing the effective conductivity and cost of gas-filled panel thermal insulations.** Griffith, B. (Lawrence Berkeley Lab., CA (United States). Building Technologies Program); Tuerler, D.; Arasteh, D. Lawrence Berkeley Lab., CA (United States). Nov 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (IN–326; CONF-9311131–6: 22. international thermal conductivity conference, Tempe, AZ (United States), 7-10 Nov 1993). Order Number DE95002328. Source: OSTI; NTIS; GPO Dep.

Gas-Filled Panels, or GFPs, are an advanced thermal insulation that employ a low-conductivity, inert gas, at atmospheric pressure, within a multilayer reflective baffle. The thermal performance of GFPs varies with gas conductivity, overall panel thickness, and baffle construction. Design parameters of baffle constructions that have a strong effect on GFP thermal resistance are (1) cavities per thickness, (2) cavity surface emittance, and (3) conductance of the baffle materials. GFP thermal performances, where the above parameters were varied, were modeled on a spreadsheet by iterative calculation of one-dimensional energy balances. Heat flow meter apparatus measurements of prototype GFP effective conductivities have been made and are compared to results of the calculations. The costs associated with varying baffle constructions are estimated based on the prices of commercial material components. Results are presented in terms of cost per area per unit thermal resistance ($/Area·R-Value) and are useful for optimizing GFP designs for air, argon, or krypton gas fills and a desired effective conductivity and thickness.

1027 (NEDO-P–9451) **Joint research project with researchers from EC countries who relate to petroleum substitution energy.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 76p. (In Japanese). Order Number DE95714834. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

As part of collecting information relating to petroleum substitution energy and energy conservation, four specialists were invited to Japan, and a joint research was started. As for research and development of a super heat pump energy accumulation system, a high-performance heat pump system developed in the project was taken up. Performance analysis based on the second law of thermodynamics and effective energy analysis were made of this heat pump, and more adequate system performance indices were proposed. As to a study on oxidation resistance of C/SiC composite materials for next generation energy use hydrogen production facilities, conducted was a study to improve oxidation resistance of carbon fiber reinforced materials using the polymer pyrolysis method. Concerning a report on process simulation of the CO2 reduction system incidental to fossil fuel utilization technology, inputting terms and others were studied to evaluate coal conversion technology in Japan using the computer program developed in the Energy Research Center in the U.K. 25 refs., 21 figs., 7 tabs.

1028 (NEI-DK–1651) **Low energy program 1990-2000 within the Energy Ministry Research Programs: Working report August 1991.** Energiministeriets Forskningsprogram. Energianvendelse i bygninger. Dansk Teknologisk Inst., Taastrup (Denmark). Energiteknologi; Danmarks Tekniske Hoejskole, Lyngby (Denmark). Lab. for Varmeisolering; Statens Byggeforskningsinstitut, Hoersholm (Denmark). Aug 1991. 68p. (In Danish). Contract ENS-1231/91-0008. Order Number DE95707293. Source: OSTI; NTIS.
EFP-91.

The low energy program utilizes the results of research projects in the field of energy use in buildings. A general evaluation is performed and applied as a basis for planning and implementation of

demonstration projects. This working report comprehends descriptions of 27 technical projects intended to optimize energy consumption, proposals and ideas for the future demonstration projects, and information on the hitherto achieved energy savings as well as the means necessary for this purpose. Examples of several implemented low-energy houses are given and the energy measures applied are evaluated. New energy topics are proposed. (EG)

1029 (ORNL/CON–362) **The North Carolina Field Test: Field performance of the preliminary version of an advanced weatherization audit for the Department of Energy's Weatherization Assistance Program.** Sharp, T.R. Oak Ridge National Lab., TN (United States). Jun 1994. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001652. Source: OSTI; NTIS; GPO Dep.

The field performance of weatherizations based on a newly-developed advanced technique for selecting residential energy conservation measures was tested alongside current Retro-Tech-based weatherizations in North Carolina. The new technique is computer-based and determines measures based on the needs of an individual house. In addition, it recommends only those measures that it determines will have a benefit-to-cost ratio greater than 1 for the house being evaluated. The new technique also considers the interaction of measures in computing the benefit-to-cost ratio of each measure. The two weatherization approaches were compared based on implementation ease, measures installed, labor and cost requirements, and both heating and cooling energy savings achieved. One-hundred and twenty houses with the following characteristics participated: the occupants were low-income, eligible for North Carolina's current weatherization program, and responsible for their own fuel and electric bills. Houses were detached single-family dwellings, not mobile homes; were heated by kerosene, fuel oil, natural gas, or propane; and had one or two operating window air conditioners. Houses were divided equally into one control group and two weatherization groups. Weekly space heating and cooling energy use, and hourly indoor and outdoor temperatures were monitored between November 1989 and September 1990 (pre-period) and between December 1990 and August 1991 (post-period). House consumption models were used to normalize for annual weather differences and a 68°F indoor temperature. Control group savings were used to adjust the savings determined for the weatherization groups. The two weatherization approaches involved installing attic and floor insulations in near equivalent quantities, and installing storm windows and wall insulation in drastically different quantities. Substantial differences also were found in average air leakage reductions for the two weatherization groups.

1030 (ORNL/TM–12692) **Energy efficiency in military family housing: Inspection results.** Levins, W.P.; Ternes, M.P. Oak Ridge National Lab., TN (United States). Sep 1994. 117p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003059. Source: OSTI; NTIS; GPO Dep.

The US military is currently upgrading its existing family housing through a revitalization process to meet its future needs. Each service must also reduce its total energy consumption intensity 25% by the year 2000 compared to the reference year 1985. Oak Ridge National Laboratory is working with the US Army and the US Air Force to help meet these goals. The projects overall goal is to develop a revitalization guidebook to aid architectural and engineering firms during the design phase of a project, to obtain effective energy efficiency in a cost-effective manner. The authors conducted detailed instrumented inspections on a total of 25 houses from Altus Air Force Base (AFB), Oklahoma; Malmstrom AFB, Montana; and Fort Monmouth, New Jersey, in order to document the condition of existing housing from an energy viewpoint. The authors also reviewed their community housing plans. Inspections revealed that many energy-efficient measures had been taken during revitalization and other miscellaneous energy-related projects, but the authors also found much remaining to be done. Defense Energy Information System (DEIS) family housing data from each location were analyzed reviewed with the respective energy coordinators, and the conclusion was that it may not be sufficiently accurate to make correct decisions regarding the implementation of projects designed to conserve energy in the family housing sector. The authors modeled each house with the US Department of Energy National Energy Audit (NEAT) computer program, which suggested that substantial cost-effective savings are available during the revitalization process. The authors are using these sources of information as a basis for their guidebook.

1031 (PNL–10125) **Whole-building energy targets "A" prototype, initial version.** Briggs, R.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001789. Source: OSTI; NTIS; GPO Dep.

The Whole-Building Energy Targets project, sponsored by the US Department of Energy (DOE), is developing a methodology for generating energy performance targets for commercial buildings. The methodology and implementing software have potential applications to energy standards and guidelines, advanced building design tools, energy retrofit analysis, demand-side management programs, and the planning and assessment of building energy research. Pacific Northwest Laboratory (PNL) is conducting the Targets project with assistance from three leading building-industry associations – the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE); the Illuminating Engineering Society of North America (IES); and the American Institute of Architects/Association of Collegiate Schools of Architecture (AIA/ACSA) Council on Architectural Research. The project's objective is to develop a methodology to generate energy performance targets for design, check the compliance of commercial-building designs with those targets, and evaluate design alternatives. Two previous phases of the project have been completed – Phase 1 Planning and Phase 2 Concept Development. The current phase is called Phase 3 System Development. Key elements of the technical approach are that targets will be based on space functions (i.e., the collection of activities and corresponding areas within a building) rather than building types, generated using economic optimization methods, and custom-generated for specific building projects. Pacific Northwest Laboratory is developing computer software, referred to as the "Targets software," that implements this methodology. The Targets software will enable the methodology to be demonstrated and tested and is intended to provide the basis for final computer applications incorporating the methodology.

3202 Transportation

Refer also to citation(s) 1073

1032 (LBL–35919) **Transportation energy use in Mexico.** Sheinbaum, C.; Meyers, S.; Sathaye, J. Lawrence Berkeley Lab., CA (United States). Jul 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94018545. Source: OSTI; NTIS; GPO Dep.

This report presents data on passenger travel and freight transport and analysis of the consequent energy use in Mexico during the 1970–1971 period. We describe changes in modal shares for passenger travel and freight transport, and analyze trends in the energy intensity of different modes. We look in more detail at transportation patterns, energy use, and the related environmental problems in the Mexico City Metropolitan Area, and also discuss policies that have been implemented there to reduce emissions from vehicles.

1033 (SAND–94-2625C) **Light shaping diffusers™ improve aircraft inspection.** Shagam, R.N. (Sandia National Labs., Albuquerque, NM (United States)); Shie, R.; Lerner, J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States);Department of Transportation, Washington, DC (United States). DOE Contract AC04-94AL85000. Contract DTFA-03-91-A0018. (CONF-9411141–1: Air Transport Association non-destructive inspection conference, Albuquerque, NM (United States), 1-3 Nov 1994). Order Number DE95001880. Source: OSTI; NTIS; GPO Dep.

Physical Optical Corporation has introduced a Light Shaping Diffuser™ (LSD) for the specialized illumination requirements of aircraft inspection. Attached to a handheld, battery-powered flashlight, this light-weight, holographic diffuser element provides bright, even illumination as aircraft inspectors perform the important task of visually examining aircraft for possible structural defects. Field trials conducted by the Aging Aircraft Program at Sandia National Laboratories confirm that the LSD-equipped flashlights are preferred by visual inspectors over stock flashlights.

1034 (SCL-DR–720077) **Roll control resonance test vehicle (RCRTV) system postflight evaluation report.** Kryvoruka, J.K. Sandia National Labs., Livermore, CA (United States). Mar 1973. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001572. Source: OSTI; NTIS; GPO Dep.

This report presents the flight test results for a reentry vehicle spin-fin roll control system. The test vehicle, designated the Roll Control Resonance Test Vehicle, was flight tested on May 10, 1972, at the Sandia Laboratories Tonopah Test Range. The purpose of the flight were (1) to demonstrate and evaluate the capability of the control system to overcome a roll resonance flight instability and (2) to confirm the analytic predictions of system performance. The flight test vehicle had built-in asymmetries which, without roll control, would have caused a persistent roll resonance instability to occur. The test was successful in that all systems functioned properly and all program and flight test objectives were accomplished. Flight test data presented herein confirm analytic predictions and flight simulation methods. Results show that the system maintained roll rate control and prevented the roll resonance instability.

3203 Industrial and Agricultural Processes

Refer also to citation(s) 68, 247, 296, 687, 1111, 1242, 1776, 1826

1035 (CONF-930802–17) **Wastes and by-products - alternatives for agricultural use.** Boles, J.L.; Craft, D.J.; Parker, B.R. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 43p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–336). From 206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993. Order Number DE95001716. Source: OSTI; NTIS; INIS.

Top address a growing national problem with generation of wastes and by-products, TVA has been involved for several years with developing and commercializing environmentally responsible practices for eliminating, minimizing, or utilizing various wastes/by-products. In many cases, reducing waste generation is impractical, but the wastes/by-products can be converted into other environmentally sound products. In some instances, conversion of safe, value-added agricultural products in the best or only practical alternative. TVA is currently involved with a diversity of projects converting wastes/by-products into safe, economical, and agriculturally beneficial products. Environmental improvement projects have involved poultry litter, cellulosic wastes, used battery acid, ammonium sulfate fines, lead smelting effluents, deep-welled sulfuric acid/ammonium bisulfate solutions, wood ash, waste magnesium ammonium sulfate slurry from recording tape production, and ammunition plant waste sodium nitrate/ammonium nitrate streams.

1036 (CONF-9309146–9) **Recovery of phosphates from elemental phosphorus bearing wastes.** Edwards, R.E.; Moore, O.E.; Sullivan, J.M. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 14p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). From 5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management; Atlanta, GA (United States); 27-29 Sep 1993. Order Number DE95001733. Source: OSTI; NTIS.

A process for oxidizing aqueous elemental phosphorus containing residues (sludges) to produce orthophosphate containing slurries suitable for subsequent reaction with ammonia to produce nitrogen and phosphate containing fertilizer products is presented. It comprises reacting aqueous elemental phosphorus containing residues with certain special mixtures of concentrated nitric acid and sulfuric acid to effect the conversion of the elemental phosphorus into mostly orthophosphoric acid and very little orthophosphorus acid with the relative ratios of the two acids being dependent upon the mole ratio of H_2SO_4:HNO_3 employed in the processing. The resulting aqueous reaction intermediate is neutralized with ammonia during processing to a fluid or solid fertilizer product. Prior to the conversion to products, the aqueous reaction intermediate may be subjected to a solids separation step to remove insoluble salts of certain environmentally undesirable metals, such as Pb, Cd, Ba, and Cr.

1037 (CONF-940724–1) **Generalized assessment of heat-storage accumulators based on energy profiles.** Hemzal, K. (Czech Technical Univ., Prague (Czech Republic). Mechanical Engineering Dept.); Wurm, J. Institute of Gas Technology, Chicago, IL (United States). [1994]. 7p. Sponsored by Institute of Gas Technology, Chicago, IL (United States). From International compressor engineering conference; West Lafayette, IN (United States); 19-22 Jul 1994. Source: OSTI; Institute of Gas Technology, 3424 South State Str., Chicago, IL 60616.

The analytical and experimental work described in this paper has to do with the development of a new and practical method for designing and rating heat-storage systems operating on a heat-capacity duty cycle of several days. It was carried out as part of a broader project evaluating equipment for exploiting solar energy and heat produced by animals on animal farms. Water-type heat accumulators were found to be an essential component of these systems; however, no generalized or specialized criteria were available for their effective design. Therefore, design optimization was carried out analytically, and the resulting approach was experimentally verified. This process led to the development of generalized criteria for rating the efficiency of stored heat utilization and to the development of reservoir design guidelines that, for practical design purposes, eliminated the need for knowing storage temperature histograms. The analysis is based on defining the storage quality as the degree of perfection (ζ_o) in terms of the initial and final exergy (available energy) ratios of the stored heat during the storage period. This function was determined analytically, experimentally verified for four design cases (with and without insulation), and related to the normalized design parameters, rate of temperature degradation, and fluid properties by time-dependent Fourier similarity number Fo. The resulting relationship of the form $-\zeta_o = k \log Fo + q$ was correlated with the measurements. For a specified storage, the "degree of perfection" (ζ_o) can then be optimized and the desirable dimensions of a reservoir selected by calculating the characteristic (or normalized) dimension from the Fourier number (Fo).

1038 (CONF-940859–27) **Automatic generation of fuzzy rules for the sensor-based navigation of a mobile robot.** Pin, F.G.; Watanabe, Y. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. international symposium on robotics and manufacturing; Maui, HI (United States); 14-18 Aug 1994. Order Number DE95001428. Source: OSTI; NTIS; GPO Dep.

A system for automatic generation of fuzzy rules is proposed which is based on a new approach, called "Fuzzy Behaviorist," and on its associated formalism for rule base development in behavior-based robot control systems. The automated generator of fuzzy rules automatically constructs the set of rules and the associated membership functions that implement reasoning schemes that have been expressed in qualitative terms. The system also checks for completeness of the rule base and independence and/or redundancy of the rules to ensure that the requirements of the formalism are satisfied. Examples of the automatic generation of fuzzy rules for cases involving suppression and/or inhibition of fuzzy behaviors are given and discussed. Experimental results obtained with the automated fuzzy rule generator applied to the domain of sensor-based navigation in a priori unknown environments using one of our autonomous test-bed robots are then presented and discussed to illustrate the feasibility of large-scale automatic fuzzy rule generation using our proposed "Fuzzy Behaviorist" approach.

1039 (DOE/AL/99286–T2) **Environmentally Conscious Manufacturing Project: Maine metal products association: [Quarterly] status report, July 1–September 30, 1994.** Eller,

S.W. Maine Metal Products Association, Portland, ME (United States). 27 Oct 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-94AL99286. Order Number DE95002021. Source: OSTI; NTIS; GPO Dep.

The following tasks are reported: Administer project; industry needs/opportunities assessment; develop and maintain assessment team and tech-source team; coordinate ongoing program of basic ECM assessments; develop and implement trial program of packaged technical assistance; facilitate industry attendance at conferences, etc.; establish ECM clearinghouse; and provide worker training in ECM.

1040 (DOE/CE/40942–3) **Project considerations and design of systems for wheeling cogenerated power.** Tessmer, R.G. Jr.; Boyle, J.R.; Fish, J.H. III; Martin, W.A. ERC, Inc., Tullahoma, TN (United States). Aug 1994. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-91CE40942. Order Number DE95002137. Source: OSTI; NTIS; GPO Dep.

Wheeling electric power, the transmission of electricity not owned by an electric utility over its transmission lines, is a term not generally recognized outside the electric utility industry. Investigation of the term's origin is intriguing. For centuries, wheel has been used to describe an entire machine, not just individual wheels within a machine. Thus we have waterwheel, spinning wheel, potter's wheel and, for an automobile, wheels. Wheel as a verb connotes transmission or modification of forces and motion in machinery. With the advent of an understanding of electricity, use of the word wheel was extended to be transmission of electric power as well as mechanical power. Today, use of the term wheeling electric power is restricted to utility transmission of power that it doesn't own. Cogeneration refers to simultaneous production of electric and thermal power from an energy source. This is more efficient than separate production of electricity and thermal power and, in many instances, less expensive.

1041 (DOE/EA–0885) **Robotic Manufacturing Science and Engineering Laboratory (RMSEL).** USDOE Albuquerque Field Office, NM (United States). Apr 1994. 153p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002672. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has prepared an environmental assessment (EA) on the proposed Robotic Manufacturing Science and Engineering Laboratory (RMSEL) at Sandia National Laboratories/New Mexico (SNL). This facility is needed to integrate, consolidate, and enhance the robotics research and testing currently in progress at SNL. Based on the analyses in the EA, DOE has determined that the proposed action is not a major Federal action significantly affecting the quality of the human environment within the meaning of the National Environmental Policy Act (NEPA) of 1969. Therefore, an environmental impact statement is not required, and DOE is issuing this Finding of No Significant Impact (FONSI).

1042 (EGG-WTD–11403) **Evaluation of the Brinecell® electrochemical oxidation unit for destruction of noncyanide strippers and other colored compounds in wastewaters.** Wikoff, P.M.; Suciu, D.F. Environmental Research and Development, Inc., Idaho Falls, ID (United States). Aug 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002036. Source: OSTI; NTIS; INIS; GPO Dep.

The noncyanide strippers used in the plating operations at Kelly Air Force Base, in San Antonio, Texas, develop an intense red color during use. Currently, the spent strippers cannot be treated in the Industrial Wastewater Treatment Plant because, even after biological treatment, the color remains too high for discharge. The Brinecell® process was evaluated for its application in treating the spent stripping solutions. The Brinecell® produces strong oxidizing agents that could treat the color causing compounds. The Brinecell® process was used to treat a 1 to 400 dilution of spent Clepo 204-T at 50 C and 60 g/L salt. After 8 hours of treatment, the color remaining was 8 units and the solution appeared colorless. Treatment of the Metalx B-9 reduced the color to 60 units. The effect of salt concentration, solution temperature, and solution pH was evaluated on the Brinecell® treatment process.

1043 (ETDE/DE-mf–95708739) **Avoidance of hazardous wastes in Hesse - CC residues: Phase II: Avoidance potential. Phase III: Practical application. Results.** Institut fuer Chemisch-Technische und Oekonomische Forschung und Beratung, Muenchen (Germany); Ministerium fuer Umwelt, Energie und Bundesangelegenheiten des Landes Hessen, Wiesbaden (Germany). Dec 1991. 225p. (In German). Order Number DE95708739. Source: OSTI; NTIS (US Sales Only).

The results of the study "Avoidance of hazardous wastes in Hesse - CC residues - Phase I: CC material flows" provided the first ever detailed overview of all CC applications and their extent and emission quantities in Hesse in 1987. The officials responsible for the commission selected the three fields of application they considered most important. These were then examined with respect to avoidance potential (Phase II) and recommendations for action to realise these potentials (Phase III). The present report contains the results of Phases II and III, which show the Hessian Ministry for the Environment and Reactor Safety possible ways of implementing and enforcing well aimed and effective abatement measures. There is a concluding synopsis of all the results appended in a separate report which gives an overview of the results of Phases I, II, and III. (orig./EF)

1044 (ETDE/DE-mf–95716137) **Information on electricity utilisation in animal breeding farms in the new Laender.** Arbeitsgemeinschaft fuer Elektrizitaetsanwendung in der Landwirtschaft (AEL). Manuskript, v. 4/92. Kastroll, H.J. Arbeitsgemeinschaft fuer Elektrizitaetsanwendung in der Landwirtschaft e.V., Essen (Germany). 1992. 22p. (In German). Order Number DE95716137. Source: OSTI; NTIS (US Sales Only).

The political change in the new Laender has set off a phase of agricultural restructuring. Many animal breeding farms have to reallocate their operations within already existing buildings or start on rebuilding measures, or face the necessity of constructing new form buildings. Building and rebuilding measures must now be executed in accordance with regulations that are applicable in the whole Federal Republic. The following information represents an attempt to provide practicians, planners, and advisors with ideas for the installation of electrical equipment in the course of rebuilding or building measures by making principal statements applicable to a prior analysis of the individual situation. The work especially addresses electricity utilisation in the areas dairy farming, porker breeding, and pig fattening. (orig.)

1045 (ETDE/DE-mf–95716305) **Utilization of solar energy for energy autonomous climatisation and irrigation of greenhouses in hot arid zones: Final report.** Muehlbauer, W.; Dobler, G. Hohenheim Univ. (Germany). Inst. fuer Agrartechnik in den Tropen und Subtropen. May 1993. 36p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0338780A. Order Number DE95716305. Source: OSTI; NTIS (US Sales Only).

The objective of the joint research work is to develop energy- and water efficient greenhouses and associated electro-mechanical systems that would make it possible to utilize ambient energies and low grade water to provide the energy and water needs of greenhouse crop production in hot arid zones. (orig.)

1046 (KCP–613-5496) **Representing manufacturing features to support design and process changes.** Brooks, S.L. (Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div.); Kirk, W.J. III; Simons, W.R.; Brown, C.W.; Greenway, R.B. Jr. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. ©Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. (CONF-9410197–1: Mid-America conference on intelligent systems, Overland Park, KS (United States), 27 Oct 1994). Order Number DE94018587. Source: OSTI; NTIS; GPO Dep.

Today there exists several parametric or variational feature-based solid modeling desip tools that aid the user in productively creating a product desip. However, most of these systems do not address mapping from the desip feature to the manufacturing feature and few, if any, automaticaly link design changes to manufacturing feature and/or process changes. Currently, most systems depend on humans to detect and propagate changes. Towards

solving this problem, we are working on a manufacturing feature representation that can detect a desip or process change and correct some or at a minimum flag the manufacturing engineer where the change affects manufacturing operations. We define Manufacturing Features as a collection of faces and edges. It is important that these faces and edges can be uniquely identified in the design feature representation. Each Manufacturing Feature has a Clipping Space that defines the extent of the material removal volume Because the Clipping Space references the design feature's faces and edges we can propagate a design change. Therefore, a change in the geometry of a face or edge is propagated when the Clipping Space is reevaluated. In this paper we present this new approach for representing manufacturing features and discuss its current and planned implementation.

1047 (NEDO-C–9316) **Survey of 1993 coal production/utilization technology promotion subsidy area models.: Area model survey as measures for environmental load reduction (interim report).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 102p. (In Japanese). Order Number DE95714835. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

With the aim of effective energy utilization, energy conservation, and environmental load reduction, investigation and study were made of structural concept and structural elements of the area model. In this area model, the following are conducted within the same site: coal pretreatment, thermal power generation, coal ash treatment/processing, waste processing/reutilization, and sewage sludge treatment/reutilization. As to pretreatment of overseas coal, desulfurization, deashing, and clean-calling are conducted by selection of specific gravity and the selective granulating method. Clean coal is supplied to the most advanced thermal power plant, and the generated power is sold. NOx and SOx are reduced by synthetic flue gas processing, and the generated coal ash and by-product gypsum are utilized for cement and construction materials. Concerning the waste recycling center, it handles receiving and incineration of general waste, and conducts business of supplying heat from the generated steam. Regarding the sewage disposal center, it handles receiving, concentration, dewatering and incineration of sewage, and aims at reutilizing burned ash as brick. Supply of cleaned coal to general manufacturers is also made. 177 refs., 26 figs., 34 figs.

1048 (NEDO-NP–9319) **Conceptual study of model introduced to utilize wastes as energy in Hokkaido.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 100p. (In Japanese). Order Number DE95714819. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

To effectively utilize agricultural, dairy farming and fishery wastes as an energy source in Hokkaido, a conceptual system of trial model was studied which produced methane gas through anaerobic fermentation with an introduction of cogeneration. Cattle excretions and scallop hepatopancreases were selected as a utilizable object. As a model region, Shikaoi Town in Tokachi Subprefecture was selected for the agricultural and dairy farming wastes, while Mombetsu City in Abashiri Subprefecture was done for the fishery wastes. Anaerobic methane fermentation at 37°C was basically designed together with gas engine cogeneration using the produced gas. It is important to thoroughly reduce the thermal loss and recover the heat, because a large quantity of energy is required for maintaining the temperature of digester and heightening that of feed in it. Because of regional coldness, supplementary supply is also needed of thermal energy to be produced from regionally existing waste oil and scrap wood. Regional organizations should be formed to promote the recovery and disposal of wastes. Not only in cost, but the total system evaluation of business performance is important with a public function to dispose of the wastes. 19 refs., 33 figs., 13 tabs.

1049 (NEI-DK–1674) **Study of efficient washing machines, dishwashers and driers: interim report.** Energistyrelsen, Copenhagen (Denmark). 1994. 55p. Order Number DE95707367. Source: OSTI; NTIS.

This interim report provides the preliminary results of a study on energy efficiency of wet appliances (washing machines, dishwashers and driers) carried out by the Group for Efficient Appliances (GEA). More specifically, the study aims at establishing a common EU basis for defining efficiency in domestic wet appliances. The intention is to utilize this common basis as a background for assessing impact of policy development (e.g. energy labels, efficiency standards, rebate programmes) on energy consumption, environment, consumers and manufacturers. The ultimate goal is to achieve lower energy and water consumption for wet appliances without loss of performance by: an increase in market penetration for energy efficient models, implementation of new efficient technologies in the manufactured models. The objective of this interim report is to summarize the findings of the first phases of the study, and in particular to put forward questions and main issues that have arisen in the course of the work. The study deals with basic assumptions regarding appliance categories, energy efficiency, performance etc., identification of the potential for improvements (technical, economic and political) as well as aspects of consumer behaviour. (au)

1050 (SAND–94-1710) **Prosperity Games prototyping with the American Electronics Association, March 8–9, 1994.** Berman, M.; VanDevender, J.P. Sandia National Labs., Albuquerque, NM (United States). Aug 1994. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001417. Source: OSTI; NTIS; GPO Dep.

Prosperity Games are an outgrowth and adaptation of move/countermove and seminar War Games. Prosperity Games are simulations that explore complex issues in a variety of areas including economics, politics, sociology, environment, education and research. These issues can be examined from a variety of perspectives ranging from a global, macroeconomic and geopolitical viewpoint down to the details of customer/supplier/market interactions in specific industries. All Prosperity Games are unique in that both the game format and the player contributions vary from game to game. This report documents the Prosperity Game conducted under the sponsorship of the American Electronics Association in conjunction with the Electronics Subcommittee of the Civilian Industrial Technology Committee of the National Science and Technology Council. Players were drawn from government, national laboratories, and universities, as well as from the electronics industry. The game explored policy changes that could enhance US competitiveness in the manufacturing of consumer electronics. Two teams simulated a presidentially appointed commission comprised of high-level representatives from government, industry, universities and national laboratories. A single team represented the foreign equivalent of this commission, formed to develop counter strategies for any changes in US policies. The deliberations and recommendations of these teams provide valuable insights as to the views of this diverse group of decision makers concerning policy changes, foreign competition, and the development, delivery and commercialization of new technologies.

1051 (TVA/NFERC–93/4) **Summary data 1992.** Berry, J.T. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 130p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (BULLETIN/Y–232). Order Number DE95001587. Source: OSTI; NTIS.

Published by TVA, this data summary gives fertilizer consumption patterns, crop acreage, application rates, and farm income and expense data by state and region for select years from 1970 to 1992.

1052 (TVA/NFERC–93/6) **Commercial fertilizers 1993.** Berry, J.T.; Montgomery, M.H. Tennessee Valley Authority, Muscle Shoals, AL (United States). Dec 1993. 40p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (BULLETIN/Y–234). Order Number DE95001585. Source: OSTI; NTIS.

This report is a compendium of tables on consumption of commercial fertilizers in the USA in 1993, including types of different fertilizers and consumption of each.

1053 (UCRL-JC–115809) **Pollution prevention: Avoiding the need to manage wastes.** Meltzer, M. Lawrence Livermore National Lab., CA (United States). Dec 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9309342–2: EUROCOURSE on environmental cleanup, Ispra (Italy), 13-17 Sep 1993). Order Number DE94014728. Source: OSTI; NTIS; INIS; GPO Dep.

Today's industrial processes generate many types of waste products that constitute risks to human health and the surrounding environment. While proper waste management procedures can lower this risk, prevention of the waste's generation will eliminate the risk. For this reason, the United States has established pollution prevention as a national objective, through the passage of its Pollution Prevention Act of 1990. Pollution prevention involves a wide range of approaches, all with the same objective: to reduce or eliminate the creation of waste at its source in other words, within the process that generates it. This objective, so beneficial to the environment, also coincides with industrial economic interests. Pollution prevention measures and greater process efficiency go hand in hand, and typically result in lower operating costs as well as greatly reduced waste management expenses. The US Environmental Protection Agency defines pollution prevention as the maximum feasible reduction of all wastes generated at production sites. This objective is accomplished largely through source reduction and reuse of input materials during production.

1054 (Z–345) **Industrial waste needs assessment: Phase 1.** Radel, R.J.; Willis, M.P. (eds.). Tennessee Valley Authority, Muscle Shoals, AL (United States). Oct 1993. 94p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE95001718. Source: OSTI; NTIS; INIS.

In January of 1992 a team was put together to begin the process of assessing the industrial waste needs of the Tennessee Valley. The team consisted of representatives from the various TVA Resource Group organizations. This initial team recommended as a starting point in the process a two-phase market research effort. A second team was then commissioned to conduct the first phase of this market research effort. The first phase of that marketing effort is now complete. This report contains an analysis of the data obtained through interviews of more than 168 individuals representing a similar number of organizations. A total of 37 TVA Resource Group employees were involved in the contact process from various organizations. In addition, the appendices provide summaries of the data used in designing the process and the reports of the Contact Coordinators (who were responsible for a series of visits). As a result of the data analysis, the Review Team makes the following recommendations: 1. Publish this report and distribute to the new management within TVA Resource Group as well as to all those participating as contacts, visitors, and contact coordinators. 2. The Resource Group management team, or management teams within each of the respective organizations within Resource Group, appoint Phase 2 assessement teams for as many of the problem areas listed in Table III as seem appropriate. We further recommend that, where possible, cross-organizational teams be used to examine individual problem areas. 3. Make this report available within Generating and Customer Groups, especially to the Customer Service Centers. 4. Establish a process to continue follow up with each of the contacts made in this assessment.

1055 (Z–348) **Small-scale biomass fueled cogeneration systems - A guidebook for general audiences.** Wiltsee, G. Tennessee Valley Authority, Muscle Shoals, AL (United States). Dec 1993. 31p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE95001737. Source: OSTI; NTIS.

What is cogeneration and how does it reduce costs? Cogeneration is the production of power – and useful heat – from the same fuel. In a typical biomass-fueled cogeneration plant, a steam turbine drives a generator, producing electricity. The plant uses steam from the turbine for heating, drying, or other uses. The benefits of cogeneration can mostly easily be seen through actual samples. For example, cogeneration fits well with the operation of sawmills. Sawmills can produce more steam from their waste wood than they need for drying lumber. Wood waste is a disposal problem unless the sawmill converts it to energy. The case studies in Section 8 illustrate some pluses and minuses of cogeneration. The electricity from the cogeneration plant can do more than meet the in-house requirements of the mill or manufacturing plant. PURPA – the Public Utilities Regulatory Policies Act of 1978 – allows a cogenerator to sell power to a utility and make money on the excess power it produces. It requires the utility to buy the power at a fair price – the utility's "avoided cost." This can help make operation of a cogeneration plant practical.

3206 Municipalities and Community Systems

Refer also to citation(s) 626, 1030, 1040, 1048

1056 (CONF-9103289–) **Energy supply on community level between communal and external supply concepts: Tasks and limits, problems and concepts of energy supply in urban and rural districts. Documentation.** Langner, A. (comp.). Friedrich-Ebert-Stiftung, Leipzig (Germany). 1992. 146p. (In German). From Conference on energy supply on community level between communal and external supply concepts; Leipzig (Germany); 25 Mar 1991. Order Number DE95708743. Source: OSTI; NTIS (US Sales Only).

The meeting was to investigate detail problems of communal energy policy and energy supply. Two of the main issues were district heating and energy conservation options. (UA)

1057 (CONF-9105455–) **Compost preparation of agricultural and non-agricultural organic recyclings: Proceedings.** Bayerisches Staatsministerium fuer Ernaehrung, Landwirtschaft und Forsten, Referat Landmaschinenwesen und Energiewirtschaft. [Bericht], v. 46. Boxberger, J. (ed.); Gronauer, A. (ed.); Helm, M. (ed.); Popp, L. (ed.). Bayerisches Staatsministerium fuer Ernaehrung, Landwirtschaft und Forsten, Muenchen (Germany). 1992. 49p. (In German). From Compost preparation of agricultural and non-agricultural organic recyclings seminar; Weihenstephan (Germany); 16 May 1991. Order Number DE95708673. Source: OSTI; NTIS (US Sales Only).

For centuries, the supply of the population with cost-effective foods was the center in agricultural policy. With an increasing fulfillment and overfulfillment of this task other tasks come to the force, for ex. raw material production, maintenance of the landscape and culture as well as sociopolitical and structure political tasks. The question arises, whether agriculture can take over the processing and ultilization of organic residual materials, and if yes, to what extent. In these articles it is attempted to answer this question. In addition, legal, tax and technical problems of compost preparation of agricultural residual materials as well as organic household rubbish are discussed. (BBR)

1058 (ETDE/DE-mf–95716122) **Energy concept Mainz: Analysis and assessment of scenarios and measures for CO_2 abatement.** Stadt Mainz (Germany). Umweltamt; Ingenieurbuero fuer Energieberatung, Haustechnik und Oekologische Konzepte GbR (EBOEK), Tuebingen (Germany); Institut fuer Energie- und Umweltforschung e.V., Heidelberg (Germany). 1994. 41p. (In German). Order Number DE95716122. Source: OSTI; NTIS (US Sales Only).

The municipal administration of Mainz was asked to commission qualified institutes to work out a comprehensive energy conservation and CO_2 abatement concept. In early 1991 the allocation of a concept containing a detailed problem analysis, assessment with respect to climatic aspects, and inference of proposals for concrete action was prepared under the responsibility of the environmental office. The results have now been presented in the form of an energy concept for Mainz showing how the resolution by the Federal Government on 11 December 1991 to abate CO_2 emissions by 25 to 30% by the year 2005 can be realised locally. (orig.)

1059 (ETDE/DE-mf–95716357) **Coordination and optimisation of collaboration between wind park, solar park and the weak electrical supply grid on the island of Kythnos: Final report. Period covered: July 1, 1985 to December 31, 1991.** Cramer, G.; Eckhardt, E.; Hackenberg, G.; Raptis, F. SMA System-, Mess- und Anlagentechnik - Regelsysteme GmbH, Niestetal

(Germany). 30 Jun 1992. 98p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 03E8068B. Order Number DE95716357. Source: OSTI; NTIS (US Sales Only).

A 'power management' was developed for the coordination and optimisation of the collaboration of the wind park (100 kW), the solar plant (100 kW) and the Diesel powerstation of the Greek island of Kythnos. As the electrical energy consumption of the island has increased greatly since the erection of the wind park in 1982 and the photo-electric plant in 1983, the wind park had to be renewed. The 5 new wind energy plants of the type AEROMAN with a rated power of 33 kW each were built at more favourable sites regarding wind, based on investigations. At the end of the project, in spite of immense problems, a project interesting on the international scale with a wind park and a photo-electric plant was erected on the weak Diesel grid, together with the Greek partner PPC. Not only could German system technology for the regulation and operating control of de-centralized electrical supply systems be demonstrated, but a modern wind park consisting of wind energy plant which worked well, was erected. (orig./HW)

1060 (NEDO-NP–9318) **Promoted structuring of model to introduce petroleum substitution energy in Hokkaido's New City Base for Regional Administration of Industry and Culture.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 116p. (In Japanese). Order Number DE95714821. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The Office Arcadia Concept (New Chitose City Base for Regional Administration of Industry and Culture) in Chitose area of Hokkaido was studied to promote the technological introduction of alternative energy to oil. The alternative energy utilizable in the said area is solar light, solar heat, natural gas and hydrothermal sources generated in the area. The energy demand in the said area is presumed able to materialize a large-scale heat supply system. Study was focused on a hybrid type mainly of the locally available alternative energy to oil. The gas cogeneration was supposed utilizable on a large scale as far as the regional heat supply from a unit of facilities. The fuel cell and heat pump were done so on a medium scale in a unit of facilities. The photovoltaic power generation and solar system were done so on a small scale also in a unit of facilities. The optimized application of system is mainly to the regional heat supply. Only in case such a system application is not feasible with unprofitability, the perfect distribution type of different facilities cannot but be taken into consideration. As measures against the surplus power generated, system linkage is needed with the general power. 30 refs., 43 figs., 49 tabs.

1061 (NEI-DK–1675) **Microbial growth in district heating pipes - preliminary investigation.** Energiministeriets Forskningsudvalg for produktion og fordeling af el og varme. Fjernvarme og produktion af el og varme. Smidt, H.D. Center for Fjernvarmeteknologi, Taastrup (Denmark). Aug 1994. 30p. (In Danish). Contract ENS-1323/92-0025. Order Number DE95707365. Source: OSTI; NTIS.

EFP-92.

Questionnaires on plants, supplementary and district heating water, connections and corrosion were sent to 332 Danish district heating plants. After analysis of the replies, 41 district heating plants were selected for interviews of which 39 took place. An investigation of microbial conditions of the water from 4 plants was carried out. Based on these investigations, it can be concluded that 10% of the plants have experienced the problem of steel corrosion and ca. 6% have experienced corrosion of copper containing sensors or soldering in connection with the latter. Interviews and a microbial investigation of the district heating water as well as the consumption of biocide in the water indicated that corrosion could be due to microorganisms. Soil bacteria have been found to cause corrosion of copper and copper alloys in Denmark. These bacteria could have entered the system in connection with installation, repair, etc. Further investigations of bacterial incidence in district heating plants where corrosion occurs should comprise descriptions of growth and corrosion conditions related to water treatment, pipe and radiator materials and plumbing practice. The type and concentration of microorganisms should be described and the development of corrosion should be measured. (AB)

3209 Education and Public Relations

1062 (ETDE/DE-mf–95708676) **Energy conservation: renewable energy sources: information and consulting in Bavaria. As of July 1992.** Bayerisches Staatsministerium fuer Wirtschaft und Verkehr, Muenchen (Germany). 1992. 27p. (In German). Order Number DE95708676. Source: OSTI; NTIS (US Sales Only).

The brochure informs on: 1. Information and consulting services in Bavaria; 2. Advanced training on the energy sector; 3. State funds for information and consulting; 4. Energy promotion programmes of the Bavarian state. (HW)

33 ADVANCED PROPULSION SYSTEMS

3301 Internal Combustion Engines

Refer also to citation(s) 924, 1072, 1087, 1088, 1173

1063 (DOE/CE/41000–2) **Toughened Silcomp composites for gas turbine engine applications: Continuous fiber ceramic composites program: Phase I final report, April 1992–June 1994.** Corman, G.S.; Luthra, K.L.; Brun, M.K.; Meschter, P.J. General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center. Jul 1994. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC02-92CE41000. Order Number DE95002851. Source: OSTI; NTIS; GPO Dep.

The two main factors driving the development of new industrial gas turbine engine systems are fuel efficiency and reduced emissions. One method of providing improvements in both areas is to reduce the cooling air requirements of the hot gas path components. For this reason ceramic components are becoming increasingly attractive for gas turbine applications because of their greater refractoriness and oxidation resistance. Among the ceramics being considered, continuous fiber ceramic composites (CFCCs) are leading candidates because they combine the high temperature stability of ceramics with the toughness and damage tolerance of composites. The purpose of this program, which is part of DOE's CFCC initiative, is to evaluate the use of CFCC materials as gas turbine engine components, and to demonstrate the feasibility of producing such components from Toughened Silcomp composites. Toughened silcomp is a CFCC material made by a reactive melt infiltration process, and consists of continuous SiC reinforcing fibers, with an appropriate fiber coating, in a fully dense matrix of SiC and Si. Based on the material physical properties, the material/process improvements realized in Phase 1, and the preliminary design analyses from Task 1, they feel the feasibility of fabricating Toughened Silcomp with the requisite physical and mechanical properties for the intended applications has been demonstrated. Remaining work for Phase 2 is to further improve the system for enhanced oxidation resistance, incorporate additional process controls to enhance the reproducibility of the material, transition the fabrication process to the selected vendors for scale-up, develop a more complete material property data base, including long-term mechanical behavior, and fabricate and test preliminary "representative part" specimens.

1064 (ETDE/DE-mf–95716321) **Degree of air delivery of the petrol engine in dynamic operation.** Philipp, K. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik. 24 Mar 1993. 147p. (In German). Order Number DE95716321. Source: OSTI; NTIS (US Sales Only).

The following problems are dealt with in the context of this dissertation: 1. Parameters influencing the degree of air delivery, 2. Experimental process for measuring the degree of air delivery, 3. Test rig system, 4. Control strategy. (orig.)

1065 (ETDE/DE-mf–95716331) **A method of simulating the inflammation phase of spark ignition engines.** Kreis, J. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau

und Elektrotechnik. 14 Jan 1993. 128p. (In German). Order Number DE95716331. Source: OSTI; NTIS (US Sales Only).

The dissertation discusses the following aspects: 1. Description and breading-up of the energy conversion process in sparte ignition engines; 2. Calculation of the energy conversion process; 3. Test stand construction; 4. Discussion of the experimental programme and its results; 5. Simulation of the duration of the inflammation phase. (HW)

1066 (ETDE/DE-mf–95716348) **Early detection of failures in internal combustion engines by analysing the angular velocity at the crankshaft.** Schneider, A. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik. 18 Dec 1992. 156p. (In German). Order Number DE95716348. Source: OSTI; NTIS (US Sales Only).

Using the example of an in-line four-stroke engine in steady-state operation, a method is developed for monitoring the combustion process by analyzing the angular velocity of the crankshaft. (orig./HW). 78 figs.

1067 (ETDE/DE-mf–95716359) **Long-time testing of the diagnosis and trend system for marine diesel engines: Final report.** Reinhold, G. M.A.N. - B und W Diesel GmbH, Augsburg (Germany). May 1990. 61p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT MTK0475B. (TEU–0134/90). Order Number DE95716359. Source: OSTI; NTIS (US Sales Only).

The diagnosis and trend system, developed within the framework of the BMFT (German Federal Ministry of Research and Technology) 'Ship of the Future' project (SdZ) was tested on-line on a four-stroke test engine on MAN B and W Diesel AG's. This test engine was fitted with worn resp. contaminated components and was run in a series of 'disturbed' operating conditions. During all the tests the engine conditions were recognised correctly by the diagnosis system and the 'disturbances' indicated and quantified, the high reliability and reproducibility expected being completely confirmed. (orig.). 6 tabs., 13 figs.

1068 (ETDE/JP-mf–95714434) **Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165).** Society of Automotive Engineers of Japan, Tokyo (Japan). 20 Apr 1994. 208p. (In Japanese). Order Number DE95714434. Source: OSTI; NTIS; Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan.

The 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention was held in Yokohama on May 11-13, and a total of 165 papers were presented. As for reduction in fuel consumption in the engine development, reported were a fuel consumption reducing technique on a new 1.5-liter engine, a fuel consumption reducing technique on a new V6 twin-com VQ engine, etc. As to advanced vehicle control systems (AVCS), a keynote lecture was given, and the following developments were reported: a brake control method for rear-end collision avoidance system based on distance between two cars, an image recognition system for advanced safety, a millimeter-wave radar system using frequency analysis, etc. Concerning environmental measures taken against exhaust gas from vehicles, studies were made on development of a new type three way catalyst for automobiles, a three way catalyst for advanced lean burn engine, thermal characteristics of diesel particulate filter, etc. With respect to information technology application to vehicle/road, a keynote lecture was given, and papers were reported on an integrated road transportation system applying information and intelligence technologies to public transportation and traffic junctions, etc.

1069 (ETDE/JP-mf–95714434, pp. 1-4) **Study of diesel cycle with a new condition of restricting a cycle and the best values.** Nagata, M. (Osaka Sangyo University, Osaka (Japan)). Society of Automotive Engineers of Japan, Tokyo (Japan). 20 Apr 1994. 208p. (In Japanese). In *Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165).* Order Number DE95714434. Source: OSTI; NTIS; Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan.

This paper discusses the theoretical expression on thermal efficiency of a diesel cycle. When calculating the diesel cycle, existence of a restricting condition is discovered that expansion work is restricted by the supplied energy as a limit, the condition having been considered in the discussion. The discussions were given on the temperature and entropy (T-S) line chart, the relationship between theoretical works and compression ratios, the relationship between theoretical thermal efficiency and the compression ratios, and the relationship between the theoretical works and temperatures when the compression ratio is taken as a parameter. The theoretical works and the theoretical thermal efficiency have an optimal compression ratio exist to maximize the theoretical works and the thermal efficiency according to such a condition as the highest temperature when the temperature ratio is kept constant. The optimal compression ratios respectively for the theoretical works and the theoretical thermal efficiency have agreed with each other. If the compression ratios are increased above the optimal values, the theoretical works and theoretical thermal efficiency have decreased. An upper limit compression ratio capable of cycling is 181 for the case of a temperature ratio of eight, if the restricting condition is not considered, and is 58 if the condition is considered. 4 refs., 5 figs., 2 tabs.

1070 (ETDE/JP-mf–95714434, pp. 85-88) **On the thermal characteristics of diesel particulate filter.** Sano, Y. (Yokohama National University, Yokohama (Japan)); Fukuda, S.; Furubayashi, M. Society of Automotive Engineers of Japan, Tokyo (Japan). 20 Apr 1994. 208p. (In Japanese). In *Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165).* Order Number DE95714434. Source: OSTI; NTIS; Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan.

Temperature distribution in a diesel particulate filter (DPF) was measured and problems of DPF regeneration according to the result thereof were considered. The tested DPFs are made of two kinds of ceramics, silicon carbide (SiC) and cordierite, and have the shape of a diameter of 119 mm and a length of 152 mm in the SiC filter, and a diameter of 144 mm and a length of 153 mm in the cordierite filter. The experimental device has such a structure that a speed variable blower of inverter control delivers a steady-state high-temperature gas flow into the tested DPF via a heater unit. The highest operation temperature is 800°C and the maximum flow rate is 60 l/min. A DPF is mounted with 40 thermocouples. Discussions were given on thermal conductivity across the partition and the fluid in the DPF, the relationship between flow rate distribution and temperature distribution, and the relationship between actual car driving conditions and diesel particulate deposition in the DPF. In performing the combustion and regeneration using a heater, it is effective to flow the high-temperature fluid from a direction reverse to that of exhaust gas to burn the diesel particulate deposits efficiently. 5 refs., 11 figs., 2 tabs.

1071 (ETDE/JP-mf–95714434, pp. 113-116) **Measurement of diesel exhaust particulate by using CO2 conversion.: Separating measure for volatile components and total soot by heating collection filter.** Yanagihara, S. (Tsukasa Sokken Co. Ltd., Tokyo (Japan)); Okada, M.; Narusawa, K. Society of Automotive Engineers of Japan, Tokyo (Japan). 20 Apr 1994. 208p. (In Japanese). In *Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165).* Order Number DE95714434. Source: Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan.

An experiment was performed on a measuring instrument of a system that collects diesel exhaust particulates on a filter, converts them into CO2 and derive their concentration, for the purpose of investigating the characteristics of the instrument. The instrument consists of control units and other components. Its measuring method is as follows: particulates collected on a filter are heated in air with the filter; volatile components are dissolved out at intermediate temperatures (300 to 600°C); and the remainder is oxidized by a high-temperature burner using a catalyst, and the CO2 concentration is measured by using an NDIR. Then, the filter temperature is raised to 750°C and held thereon to oxidize up to total

soot. The concentrations of the volatile components at the intermediate temperature and the total soot are calculated from amount of the sample exhaust gas passed through the filter, the CO2 concentration, and the volume of the circulation stream. Measurements were made on the effect of the sampling lines and filter temperatures, and engine operating conditions that are varied. The instrument is capable of measuring total soot and SOF component concentration of diesel exhaust particulates if an adequate measuring condition is established. 5 refs., 9 figs.

3303 Electric-Powered Systems

Refer also to citation(s) 609, 896, 897, 898, 1083

1072 (ANL/ES/CP–82394) **EAGLES 1.1: A microcomputer software package for analyzing fuel efficiency of electric and gasoline vehicles.** Marr, W.M. Argonne National Lab., IL (United States). 15 May 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410221–1: Electric, hybrid and alternative fuel vehicles conference, Aachen (Germany), 31 Oct - 4 nov 1994). Order Number DE95001119. Source: OSTI; NTIS; GPO Dep.

As part of the U.S. Department of Energy's electric/hybrid vehicle research program, Argonne National Laboratory has developed a computer software package called EAGLES. This paper describes the capability of the software and its many features and potential applications. EAGLES version 1.1 is an interactive microcomputer software package for the analysis of battery performance in electric-vehicle applications, or the estimation of fuel economy for a gasoline vehicle. The principal objective of the electric-vehicle analysis is to enable the prediction of electric-vehicle performance (e.g., vehicle range) on the basis of laboratory test data for batteries. The model provides a second-by-second simulation of battery voltage and current for any specified velocity/time or power/time profile, taking into consideration the effects of battery depth-of-discharge and regenerative braking. Alternatively, the software package can be used to determine the size of the battery needed to satisfy given vehicle mission requirements (e.g., range and driving patterns). For gasoline-vehicle analysis, an empirical model relating fuel economy, vehicle parameters, and driving-cycle characteristics is included in the software package. For both types of vehicles, effects of heating/cooling loads on vehicle performance can be simulated. The software package includes many default data sets for vehicles, driving cycles, and battery technologies. EAGLES 1.1 is written in the FORTRAN language for use on IBM-compatible microcomputers.

1073 (ANL/ES/CP–82395) **Effects of battery technologies, driving patterns, and climate comfort control on the performance of electric vehicles.** Marr, W.W.; Wang, M.Q.; Santini, D.J. Argonne National Lab., IL (United States). 15 May 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410221–2: Electric, hybrid and alternative fuel vehicles conference, Aachen (Germany), 31 Oct - 4 nov 1994). Order Number DE95001102. Source: OSTI; NTIS; GPO Dep.

A computer software package, EAGLES, has been developed at Argonne National Laboratory to analyze electric vehicle (EV) performance. In this paper, we present EAGLES predictions of EV driving range, acceleration rate, and energy consumption under various driving patterns, with different battery technologies, and with assumptions concerning use of air conditioners and/or heaters for climate comfort control. The specifications of a baseline, four-passenger EV for given design performance requirements are established, assuming urban driving conditions represented by the Los Angeles 92 (LA-92) driving cycle and using battery characteristics similar to those of the United States Advanced Battery Consortium (USABC) midterm battery performance goals. To examine the impacts of driving patterns, energy consumption is simulated under three different driving cycles: the New York City Cycle, the Los Angeles 92 Cycle, and the ECE-15 Cycle. To test the impacts of battery technologies, performance attributes of an advanced lead-acid battery, the USABC midterm battery goals, and the USABC long-term battery goals are used. Finally, EV energy consumption from use of air conditioners and/or heaters under different climates is estimated and the associated driving range penalty for one European city (Paris) and two United States cities (Chicago and Los Angeles) is predicted. The results of this paper show the importance of considering various effects, such as battery technology, driving pattern, and climate comfort control, in the determination of EV performances. Electric vehicle energy consumption decreases more than 20% when a battery with characteristics similar to the USABC long-term goals is used instead of an advanced lead-acid battery.

1074 (CONF-9404219–) **51st (Spring 1994) Meeting on Cryogenics and Superconductivity.** No corporate text available. 25 Apr 1994. 307p. (In Japanese). From 51. (spring 1994) meeting on cryogenics and superconductivity; Yokohama (Japan); 25-27 Apr 1994. Order Number DE95714332. Source: OSTI; NTIS; Available from Çryogenic Society of Japan, 12-8, Hongo 6-chome, Bunkyo-ku, Tokyo, Japan.

The 51st (Spring 1994) Meeting on Cryogenics and Superconductivity was held in Yokohama on April 25-27, and a total of 265 papers were reported. As for refrigerators, a lot of lectures were made such as on the history and a new progress of the development of pulse tube refrigerators. As to Bi-system wire rod making and coil making and their mechanical properties, reports were made on formation of Bi-system high-temperature superconductors by the diffusion method, improvement of mechanical properties of Bi-system Ag sheath tape, a study on wire rod and coil making by the gas pressure melting method, etc. With relation to magnetic levitation, reports were made on ac magnetic properties of high temperature superconductors in the magnetic levitation system, etc. Concerning fusion reaction, reported were design of ITER conductors, the present status of constructing superconductive magnet for large helical facilities, etc. With respect to metal-based structural materials, studies were made on fracture toughness of SUS316 steel and the weld at extremely low temperature and in the strong magnetic field, etc. Besides, a lot of papers were presented on helium heat transfer, measurement systems/functional materials, properties of superconductive materials, etc.

1075 (DOE/EE–0026) **Electric and Hybrid Vehicles Program: Seventeenth annual report to Congress for Fiscal Year 1993.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Office of Transportation Technologies. Aug 1994. 73p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001711. Source: OSTI; NTIS; GPO Dep.

This program, in cooperation with industry, is conducting research, development, testing, and evaluation activities to develop the technologies that would lead to production and introduction of low-and zero-emission electric and hybrid vehicles into the Nation's transportation fleet. This annual report describes program activities in the areas of advanced battery, fuel cell, and propulsion systems development. Testing and evaluation of new technology in fleet site operations and laboratories are also provided. Also presented is status on incentives (CAFE, 1992 Energy Policy Act) and use of foreign components, and a listing of publications by DOE, national laboratories, and contractors.

1076 (DOE/ID/13074–T13) **Kansas State University, DOE/KEURP site operator program: Year 4 first quarter report, June 1–August 31, 1994.** Hague, J.R. Kansas State Univ., Manhattan, KS (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-91ID13074. Order Number DE95002253. Source: OSTI; NTIS; GPO Dep.

Kansas State University and the electric utilities, after evaluating joining EV America, has concluded that EVs still have a ways to go before any large scale market demonstration can be undertaken. Not only does the technology need to be improved but, some large scale corporate commitment needs to be focused to ensure that vehicles can be delivered on time and within a reasonable price range. To date, even when high prices are paid for EVs, manufacturers cannot seem to deliver within a reasonable time, say less than one year. The Kansas Electric Utilities Research Program has divided its efforts into off-road and on-road EV applications. After being involved with both activities and through a number of studies, it has been concluded that off-road EVs have a financial

competitive advantage over other alternate fuel vehicles of similar type, but these products are not being marketed effectively. Just the opposite can be said of the on-road vehicles. Kansas State University and its partners will continue to test, evaluate, and hopefully develop products that can compete in the market of all alternate fuel vehicles. Hopefully, the Department of Energy will "refocus" its original efforts, that is to field test small numbers of vehicles, components, and infrastructure products until such time when there is a clear "product winner". It is vitally important to recognize that fleet vehicles cannot support the commercialization effort of EVs by themselves.

1077 (EGG-EP–11237-Qtr1) **Electric and Hybrid Vehicle Program: Site Operator Program: Quarterly progress report, October–December, 1993 (first quarter of fiscal year 1994).** Kiser, D.M. (EG&G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab.); Warren, J.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001925. Source: OSTI; NTIS; GPO Dep.

The DOE Site Operator Program was initially established to meet the requirements of the Electric and Hybrid Vehicle Research, Development, and Demonstration Act of 1976. The Program has since evolved in response to new legislation and interests. Its mission now includes three major activity categories: (1) Advancement of Electric Vehicle (EV) technologies; (2) development of infrastructure elements needed to support significant EV use; (3) increasing public awareness and acceptance of EVs. The 14 Program participants, their geographic locations, and the principal thrusts of their efforts are identified. The EV inventories of each participant are summarized. The topics of this report include participants' experience with EV operation; an appraisal of the overall current status of EVs for transportation; program management; and a program experience overview, the result of analyzing Site Operator inputs, provides an insight into the variables that can affect electric vehicle performance and operating cost.

1078 (EGG-EP–11320) **Performance testing of the AC propulsion ELX electric vehicle.** Kramer, W.E.; MacDowall, R.D.; Burke, A.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1994. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002049. Source: OSTI; NTIS; GPO Dep.

Performance testing of the AC Propulsion ELX electric vehicle is described. Test data are presented and analyzed. The ELX vehicle is the first of a series of electric vehicles of interest to the California Air Resources Board. The test series is being conducted under a Cooperative Research and Development Agreement (CRADA) between the US Department of energy and the California Air Resources Board. The tests which were conducted showed that the AC Propulsion ELX electric vehicle has exceptional acceleration and range performance. when the vehicle's battery was fully charged, the vehicle can accelerate from 0 to 96 km/h in about 10 seconds. Energy consumption and range tests using consecutive FUDS and HWFET Driving cycles (the all-electric cycle) indicate that the energy economy of the AC Propulsion ELX electric vehicle with regenerative braking is 97 W·h/km, with a range of 153 km (95 miles). Computer simulations performed using the SIMPLEV Program indicate that the vehicle would have a range of 327 km (203 miles) on the all-electric cycle if the lead acid batteries were replaced with NiMH batteries having an energy density of 67 W·h/kg. Comparisons of FUDS test data with and without regenerative braking indicated that regenerative braking reduced the energy consumption of the ELX vehicle by approximately 25%.

1079 (ETDE/DE-mf–95716313) **Photovoltaic solar filling station Hannover Fair 1988: Final report.** Maass, K.; Weber, H.; Muehle, H.; Willmes, H. Deutsche Aerospace AG, Wedel (Germany). Fachgebiet Solartechnik. Aug 1993. 95p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0328916A. Order Number DE95716313. Source: OSTI; NTIS (US Sales Only).

In view of the growing importance of photovoltaic technology it is expected that, also for transport purposes, part of the required energy for the operation of electric-powered vehicles will have to be supplied by solar systems. The "Solar filling station" work group has made a major contribution in the following areas: solar architecture, adaption of solar generators to various electric-powered vehicles, battery charging technology, battery management as well as input into the network during times when the actual trade fair does not take place, as this project was being carried out during the Hannover trade fair. The results achieved in the course of the project show that solar filling stations, in connection with a fleet of electric-powered vehicles, can be an attractive option for theme parks, health resorts, and islands with holiday resorts. (BWI)

1080 Integrated null-flux suspension and multiphase propulsion system for magnetically-levitated vehicles. Rote, D.M.; He, Jianliang; Johnson, L.R. To Dept. of Energy. 1992. Filed date 28 Sep 1992. U.S. Patent Application 7-952,247. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001776. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report discusses a propulsion and stabilization system comprising a series of figure 8 coils mounted vertically on the walls of the guideway to provide suspension, lateral guidance and propulsion of a magnetically levitated vehicle. This system further allows for altering the magnetic field effects by changing the relative position of the loops comprising the figure 8 coils either longitudinally and/or vertically with resulting changes in the propulsion, the vertical stability, and the suspension.

1081 Improved high speed maglev design. Rote, D.M.; He, Jianliang; Coffey, H.T. To Dept. of Energy. 1992. Filed date 28 Sep 1992. U.S. Patent Application 7-952,439. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001775. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report discusses a propulsion and stabilization system for an inductive repulsion type magnetically levitated vehicle which is propelled and suspended by a system which includes dividing the superconducting magnets into two types: a strong field magnet which is located vertically below the vehicle for propulsion and guidance and a weak field superconducting magnet located at the ends of the vehicle for levitation and added guidance. Several proposed embodiments exist for the placement of the magnetic field shielding: locating the shielding on the vehicle, locating the shielding on the guideway, and locating the shielding on the guideway and adding shielding to the vertical undercarriage. In addition, the separation between the be vehicle and the guideway can be controlled to reduce the exposure of the passenger cabin to magnetic fields.

3304 Hybrid Systems

Refer also to citation(s) 1075, 1077

1082 (ETDE/DE-mf–95716326) **Car power supply with fast synchronous generator.** Krueger, M. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik. 5 Aug 1992. 172p. (In German). Order Number DE95716326. Source: OSTI; NTIS (US Sales Only).

The feasibility of a high-speed charging aggregate in the 10 kW range and for a speed above 30000 rpm was investigated. The electric characteristics were tested in practice in an experimental set-up, and losses were analyzed. (orig.)

1083 (NREL/TP–473-7260) **Current Hybrid Electric Vehicle performance based on temporal data from the world's largest HEV fleet.** Wipke, K. National Renewable Energy Lab., Golden, CO (United States). Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC36-83CH10093. (CONF-941221–2: 12. International electric vehicle symposium, Anaheim, CA (United States), 5-7 Dec 1994). Order Number DE94011859. Source: OSTI; NTIS; GPO Dep.

The United States Department of Energy (DOE) procured new data collection equipment for the 42 vehicles registered to compete in the 1994 Hybrid Electric Vehicle (HEV) Challenge, increasing the amount of information gathered from the worlds largest fleet of HEVs. Data were collected through an on-board data storage device and then analyzed to determine effects of different hybrid control strategies on energy efficiency and driving performance. In

this paper, the results of parallel hybrids versus series hybrids with respect to energy usage and acceleration performance are examined, and the efficiency and performance of the power-assist types are compared to that of the range-extender types. Because on-board and off-board electrical charging performance is critical to an efficient vehicle energy usage cycle, charging performance is presented and changes and improvements from the 1993 HEV Challenge are discussed. Peak power used during acceleration is presented and then compared to the electric motor manufacturer ratings. Improvements in data acquisition methods for the 1995 HEV Challenge are recommended.

3306 Vehicle Design Factors

Refer also to citation(s) 130, 1068, 1762

3307 Emission Control

Refer also to citation(s) 1068, 1070, 1071

1084 (ETDE/DE-mf–95716369) **Testing of low-emission motorcycles.** Hartung, L.; Kalis, P.O.; Appel, H. Technische Univ. Berlin (Germany). Inst. fuer Fahrzeugtechnik. Jul 1991. 119p. (In German). Sponsored by Umweltbundesamt, Berlin (Germany). Contract UFOPLAN 10405507. Order Number DE95716369. Source: OSTI; NTIS (US Sales Only).

Also published as 'Umweltbundesamt. Texte' v. 4/92.

The aim of the project was the investigation of measures to reduce emissions of regulated and unregulated exhaust components of motorcycles. Five vehicles, belonging to different engine-power and weight categories, were selected for the research project on the basis of the approval statistics of the Federal Office of Road Transportation (Kraftfahrtbundesamt). The regulated exhaust components HC, CO and NO_x (not yet regulated for motorcycles) and the unregulated components benzene and polycyclic aromatic hydrocarbons were determined for the original and the emission reduced condition. The emission of regulated exhaust gas components was determined for verying driving cycles to optain a more general emission spectrum. Furthermore, the influence of catalysts on exhaust opacity of two-stroke-engines was investigated. The durability of the catalysts was checked only on a bicycle with auxiliary engine equipped with an open loop catalyst by the manufacturer. The measurements of the original condition showed that, except for one, all test vehicles remained below the production limit values for the ECE cycle. The Yamaha RD 350 exceeded the HC emission limit value by 30%. (orig.)

1085 (ETDE/JP-mf–95714434, pp. 77-79) **New type three way catalyst for automobiles.** Takahashi, H. (Nissan Motor Co. Ltd., Tokyo (Japan)); Sekiba, T. Society of Automotive Engineers of Japan, Tokyo (Japan). 20 Apr 1994. 208p. (In Japanese). In *Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165).* Order Number DE95714434. Source: OSTI; NTIS; Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan.

The problems with palladium (Pd) used for a three-way catalyst are that it degrades severely when used at elevated temperatures and its conversion rate for nitrogen oxides in a rich atmosphere is low. This paper describes the results of solution of these problems the Pd catalyst has and a development of a Pd catalyst that has performance at a practical use level as a three-way catalyst. A three-way catalyst reduces HC, CO and NOx in exhaust gas simultaneously. Prototype catalysts composed of platinum (Pt), rhodium (Rh), Pd, and platinum-rhodium were fabricated and tested on an engine bench to measure the conversion rate varying the air-to-fuel (A/F) ratio amplitude. The Pd catalyst is more advantageous in poisoning of hydrocarbons than the Pt catalyst. Furthermore, experimental discussions were given on the Pd catalyst as to improvement of its heat resistance and NOx handling characteristics. As a result of investigating the performance of the developed Pd three-way catalyst by making evaluations using the engine bench test, the NOx conversion rate was found equivalent to that in Pt and Rh catalysts even under a condition with small A/F amplitude. 6 refs., 7 figs., 1 tab.

1086 (ETDE/JP-mf–95714434, pp. 81-84) **Three way catalyst for advanced lean burn engine.** Takami, A. (Mazda Motor Corp., Hiroshima (Japan)); Takemoto, T.; Ichikawa, S.; Saito, F.; Komatsu, K. Society of Automotive Engineers of Japan, Tokyo (Japan). 20 Apr 1994. 208p. (In Japanese). In *Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165).* Order Number DE95714434. Source: OSTI; NTIS; Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan.

This paper discusses a three-way catalyst for lean burn engine that can purify HC, CO and NOx simultaneously from the theoretical combustion region to the lean combustion region. The experimented catalysts are made of Cu/zeolite, Pt/zeolite and Pt-Ir-Rh/zeolite. The experiment was performed with the catalysts installed in a vehicle mounting a lean burn engine to measure emission levels according to the 10-15 mode exhaust gas test and discuss active metals, change in specific surface, and effect of metal compounding. Compounding of precious metals (Pt, Ir and Rh) has such effects as to highly disperse the precious metals on zeolite, and suppress particle growth under elevated temperatures. The Pt-Ir-Rh/zeolite catalyst has high performance of purifying HC, CO and NOx from a theoretic air-to-fuel ratio to an oxygen excess condition, and its NOx purifying performance has not decreased even under coexistence of H2O. A durability test using the lean burn engine has proved very little decrease in the HC, CO and NOx purifying rates. 6 refs., 11 figs., 1 tab.

1087 (PSI–94-20) **Reducing nitrogen oxides in exhaust gases by means of urea. Final report.** Koebel, M. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Elsener, M.; Marti, T. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Nov 1994. 63p. (In German). BEW-Projekt EF-FOS (89)002. Order Number DE95713895. Source: OSTI; NTIS.

Ammonia has been used for about twenty years as a selective reducing agent for reducing NO_x in lean exhaust gases containing excess oxygen. Although urea has distinct advantages compared with ammonia (solid substance, cheap, practically nontoxic, not explosive) it has hardly been considered for this purpose. In the present work the possibilities of using aqueous urea solutions for the DeNOx processes based on selective catalytic reduction (SCR) and selective non catalytic reduction (SNCR) are explored. SCR: Urea-SCR poses little problems: If the process equipment is properly designed, no appreciable emissions of flue gas components related to urea are found, e.g. isocyanic acid, hydrogen cyanide, nitrous oxide, urea, biuret, cyanuric acid and melamine. On the other hand, like ammonia, use of urea leads to an emission of ammonia which limits the maximum attainable degree of NO_x reduction. With industrial bulk catalysts based on TiO_2-WO_3-V_2O_5 and gas hourly space velocities of 10'000 h^{-1}, NO_x reductions of over 98% at an "ammonia slip" below 10 ppm may be attained. SNCR: The use of urea instead of ammonia shifts the optimum temperature window upwards by about 50 K. Besides an "ammonia slip", some isocyanic acid is found, and the emissions of carbon monoxide and nitrous oxide are definitely higher. As nitrous oxide is considered to be a greenhouse gas and a scavenger of stratospheric ozone, the use of urea is no longer recommended in future SNCR installations. If the advantages of storage convenience of urea to be combined optimally with the advantages of ammonia as selective reducing agent, the hydropyrolysis of urea in an external reactor is a possible solution. (author) 38 figs., 5 tabs., 36 refs.

3308 Alternative Fuels

1088 (ETDE/DE-mf–95716304) **Pilot programme 'Methanol-derived fuel M100': Testing of methanol-fuelled MAN city buses in different German towns. Final report.** Knorr, H. MAN Nutzfahrzeuge AG, Nuernberg (Germany). 30 Jun 1989. 18p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT TV 8423E. Order Number DE95716304. Source: OSTI; NTIS (US Sales Only).

Methanol-fuelled city buses by MAN have been tested with good results in Bochum, Cologne, and Nuremberg. The project has

proved the applicability of methanol-fuelled buses in urban transportation. They will help to improve the air quality in urban regions. (orig./EF)

1089 (NEDO-P–9301) **Present status of petroleum substitution energy (USA).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 93p. (In Japanese). Order Number DE95714808. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order for Japan to promote her development/introduction of petroleum substitution energy, information was collected about its trend of development/introduction in the US. In 1993, the nuclear power generation and renewable energy power generation produced 13.3 quadrillion BTU, corresponding to 19% of the total US energy production. Though continuously growing, the photovoltaic power generation industry is competitive only in a still limited field of use. The application of wind energy is far advanced. In order to recover the biomass energy from municipal solid wastes and wood, the leachate is recirculated for accelerating the waste decomposition in the landfill. Energy can be obtained from the methane produced as a result. Further, developed is a technology to excavate the landfill for finding out the renewable waste. The US Administration proposed expanding the US export of environmental technology. 2 figs., 12 tabs.

1090 (NEDO-P–9302) **Present status of petroleum substitution energy (EC).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 95p. (In Japanese). Order Number DE95714810. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order for Japan to promote her development/introduction of petroleum substitution energy, information was collected about its trend of development/introduction in the EC. Having been grappling with each of the plans, i.e., SAVE (promotion of energy saving), ALTERNER (development of new energy and renewable energy), THERMIE (new energy technology) and JOULE (long-term research and development of new energy technology), the EC commission expects that the technological study through those plans will be able to reduce the quantity of carbon dioxide emission in 1990 by 7.5% in 2000. The carbon dioxide tax was introduced in Finland, Norway and Sweden. Among the EC member countries, Denmark and Holland only decided on introducing it. The European Energy Charter remains under negotiation. In the development of petroleum substitution energy, progress is being made in utilization of solar energy for the building, gasification of coal and development of geothermal energy. In the meantime, the ex-USSR and Eastern Europe were assisted in the field of energy. 5 tabs.

1091 (NEDO-P–9303) **Present status of petroleum substitution energy (UK).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 99p. (In Japanese). Order Number DE95714813. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order for Japan to promote her development/introduction of petroleum substitution energy, information was collected about its trend of development/introduction in the UK. The UK program based on the Framework Convention on Climate Change aims at reducing the predicted quantity of carbon dioxide emission in 2000 by 10 million carbon tons with an explicit statement of quantitatively reducing the methane, nitrogen suboxide, nitrogen dioxide, carbon dioxide, volatile organic compounds and carbon halogenide by 10%, 75%, 25%, 50%, 35% and 90%, respectively. In the R and D in relation to the alternative energy of oil, 380 projects amounting to 23 million pounds were executed from 1992 to 1993. As for the wind energy, there are 17 power generation farms having a capacity of generating the power of about 100MW. In the biomas fuel research, importance is attached to the incineration of wastes and utilization of gas generated in the reclaimed ground. For the photovoltaic power generation, grappling has been started with a switching from the passive type to the active type. 3 tabs.

1092 (NEDO-P–9304) **Present status of petroleum substitution energy (France).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 69p. (In Japanese). Order Number DE95714815. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order for Japan to promote her development/introduction of petroleum substitution energy, information was collected about its trend of development/introduction in France. The counter oil crisis in the mid-eighties weakened France's interest in energy renewals which do not abound in France at present. Only firewood remains in its position. Together with the transfer of know-how, the recent policy is focused on French industries' making inroads into renewable energy markets which have an enormous potential particularly in the third world countries. Presently, progress is being made in research on the photoelectric, wind, small-scale hydroelectric, photovoltaic, geothermal and biomass energy. Levy report proposes that French farmers be compensated for their reduction in income due to the new European agricultural policy by the plant cultivation of coleseed and beetroots which are properly used for the biofuel production. It is however pessimistically feared that the compensation is nothing else but a mere subvention for the agriculture. 6 refs., 23 tabs.

1093 (NEDO-P–9305) **Present status of petroleum substitution energy (Germany).** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 110p. (In Japanese). Order Number DE95714816. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

In order for Japan to promote her development/introduction of petroleum substitution energy, information was collected about its trend of development/introduction in Germany. According to a survey report by the Federation of German Electric Power Companies, the power of 19 billion kWh was supplied in 1992 through utilization of hydraulic force, wastes, garbage gas, wind force and solar energy. The above power supply corresponds to 4.3% of the total power supply in Germany. Among those utilized power sources, the hydraulic force, wind force and solar energy are renewable sources which have a technological potential on an economically significant scale. The Federation predicts that the ratio of alternative energy will rise up to about 30% by 2005. Photovoltaic power generation is being technologically developed with crystalline dye cells. Rostock City started the development of a 180MW power plant barge. An oil company experimentally started the synthesis of gasoline from the plant called ramie. A village in Thuringen started the operation of power station with wheat straw. 8 refs., 9 figs., 19 tabs.

1094 (NEDO-P–9314) **Survey on econometric analysis of petroleum substitution energy for fiscal 1993.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 308p. (In Japanese). Order Number DE95714806. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The petroleum substitution energy was positioned and the feasibility of its use was surveyed. An energy flow model was worldwidely structured. Through various simulations, the influence of carbon tax and other different policies when implemented was econometrically surveyed and analyzed on Japan through the worldwide energy flow. The environmental problems brought about by the quantitative increase in carbon dioxide emission was taken into consideration. How the policies and measures are effective in preventing the global warming was studied with models. Both cases, i.e., carbon taxation and direct regulation were simulated. The main countries which will emit the carbon dioxide in future are developing countries promising in economic development. Therefore in the simulation, importance was attached to the quantitative decrease in carbon dioxide in the developing countries. As a result of simulation, the final energy demand is reduced by 28% and 5% in case of carbon taxation and direct regulation, respectively. Based on the quantity of carbon dioxide emission of 5.8 billion tons in 1990, that in 2100 will be 21.8, 7.4 and 18.9 billion tons in case

of present status maintenance, carbon taxation and direct regulation, respectively. 28 refs., 84 figs., 91 tabs.

1095 (NEI-DK–1650) **Alternative propellants and sustainable development: Pilot-project-report.** Joergensen, K. Danmarks Tekniske Hoejskole, Lyngby (Denmark). Fysik-Kemisk Inst. May 1993. 104p. (In Danish). Contract ENS-51161-92.0060. Order Number DE95707291. Source: OSTI; NTIS.

The aim was to present and discuss current information gathered from a survey of relevant literature, also from abroad, on the all-round impacts which might be expected if an expanded use of alternative propellants should take place within the transportation sector in Denmark. The focus is on renewable energy sources such as rape seed oil, natural gas, liquefied petroleum gases, methane, hydrogen and fuel cells that convert hydrogen, natural gas, methanol etc. to electric power. (AB) (197 refs.)

35 ARMS CONTROL

3501 Policy, Negotiations, and Legislation

1096 (IAEA-INFCIRC–448) **The Treaty for the prohibition of nuclear weapons in Latin America and the Caribbean (Tlatelolco Treaty).** International Atomic Energy Agency, Vienna (Austria). 24 Jun 1994. 11p. (In Arabic, Chinese, English, French, Russian, Order Number DE95605209. Source: OSTI; NTIS (US Sales Only); INIS.

In a note verbale of 10 June 1994, the Agency was informed that, on 30 May 1994, the instruments necessary to bring the Treaty for the Prohibition of Nuclear Weapons in Latin American and the Caribbean into force for the Federative Republic of Brazil had been deposited. As requested by the Permanent Mission of Brazil to the International Organizations in Vienna, the text of the note is attached hereto for the information of Member States.

1097 (LA-SUB–94-153) **Future directions for arms control and nonproliferation: Conference summary.** Los Alamos National Lab., NM (United States); Science Applications International Corp., San Diego, CA (United States). 6 Jul 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001753. Source: OSTI; NTIS; GPO Dep.

This report provides a summary of the presentations and discussions at the Spring 1994 CNSN-Wilton Park Conference. The Conference was one of a series on US-European security cooperation organized by The Center for National Security Negotiations (CNSN) of Science Applications International Corporation. These conferences bring together government and non-government experts, primarily from the United States and Europe, to discuss a range of regional and global security issues. The conferences provide an opportunity to explore, in a frank and off-the-record environment, common interests and concerns, as well as differences in approach that affect trans-Atlantic cooperation. This report is divided into the following three areas: (1) implementation of existing and pending agreements; (2) non-proliferation: prospects for trans-Atlantic cooperation; and (3) future directions in arms control.

1098 (UCRL-LR–114070-6) **Director's series on proliferation.** Bailey, K.C.; Price, M.E. (eds.). Lawrence Livermore National Lab., CA (United States). 17 Oct 1994. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95001785. Source: OSTI; NTIS; GPO Dep.

This series is an occasional publication of essays on the topics of nuclear, chemical, biological, and missile proliferation. Essays contained in this document include: Key issues on NPT renewal and extension, Africa and nuclear nonproliferation, Kenya's views on the NPT, Prospects for establishing a zone free of weapons of mass destruction in the middle east, effects of a special nuclear weapon materials cut-off convention, and The UK view of NPT renewal.

3502 Proliferation

Refer also to citation(s) 1097

3503 Verification

Refer also to citation(s) 547, 1293, 1666, 1696

1099 (UCRL-ID–117293) **CTBT technical issues handbook.** Zucca, J.J. (ed.). Lawrence Livermore National Lab., CA (United States). May 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95002595. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this handbook is to give the nonspecialist in nuclear explosion physics and nuclear test monitoring an introduction to the topic as it pertains to a Comprehensive Test Ban Treaty (CTBT). The authors have tried to make the handbook visually oriented, with figures paired to short discussions. As such, the handbook may be read straight through or in sections. The handbook covers four main areas and ends with a glossary, which includes both scientific terms and acronyms likely to be encountered during CTBT negotiations. The following topics are covered: (1) Physics of nuclear explosion experiments. This is a description of basic nuclear physics and elementary nuclear weapon design. Also discussed are testing practices. (2) Other nuclear experiments. This section discusses experiments that produce small amounts of nuclear energy but differ from explosion experiments discussed in the first chapter. This includes the type of activities, such as laser fusion, that would continue after a CTBT is in force. (3) Monitoring tests in various environments. This section describes the different physical environments in which a test could be conducted (underground, in the atmosphere, in space, underwater, and in the laboratory); the sources of non-nuclear events (such as earthquakes and mining operations); and the opportunities for evasion. (4) On-site inspections. A CTBT is likely to include these inspections as an element of the verification provisions, in order to resolve the nature of ambiguous events. This chapter describes some technical considerations and technologies that are likely to be useful. (5) Selecting verification measures. This chapter discusses the uncertain nature of the evidence from monitoring systems and how compliance judgments could be made, taking the uncertainties into account. It also discusses how to allocate monitoring resources, given the likelihood of testing by various countries in various environments.

36 MATERIALS

Refer also to citation(s) 924, 1019

3601 Metals and Alloys

Refer also to citation(s) 90, 153, 211, 212, 807, 811, 813, 1061, 1074, 1222, 1249, 1338, 1366, 1409, 1429, 1490, 1498, 1504, 1508, 2018, 2317, 2320, 2328, 2342, 2358, 2380, 2436, 2570

1100 (ANL/ET/CP–81606) **Properties of V-4Cr-4Ti for application as fusion reactor structural components.** Chung, H.M.; Loomis, B.A.; Smith, D.L. Argonne National Lab., IL (United States). Energy Technology Div. Aug 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940664–34: ISFNT-3: 3rd international symposium on fusion nuclear technology, Los Angeles, CA (United States), 27 Jun - 1 jul 1994). Order Number DE95002907. Source: OSTI; NTIS; INIS; GPO Dep.

Vanadium-base alloys are promising candidate materials for application in fusion reactor first-wall and blanket structures because they offer several important advantages, i.e., inherently low irradiation-induced activity, good mechanical properties, good compatibility with lithium, high thermal conductivity, and good resistance to irradiation-induced swelling and damage. As part of a program to screen candidate alloys and develop an optimized vanadium-base alloy, extensive investigations of various V-Ti, V-Cr-Ti, and V-Ti-Si alloys have been conducted after irradiation in lithium in fission reactors. From these investigations, V-4 wt.% Cr-4 wt.% Ti was identified as the most promising alloy. The alloy exhibited attractive mechanical and physical properties that are prerequisites for first-wall and blanket structures, i.e., high tensile strength, high ductility, good creep properties, high impact energy,

low ductile-brittle transition temperature before and after irradiation, excellent resistance to irradiation-induced swelling and microstructural instability, and good resistance to corrosion in lithium. In particular, the alloy is virtually immune to irradiation-induced embrittlement, a remarkable property compared to other candidate materials being investigated in the fusion-reactor-materials community. Effects of helium, charged dynamically in simulation of realistic fusion reactor conditions, on tensile, ductile-brittle transition, and swelling properties were insignificant.

1101 (AREAEE–308) **The metallurgy of superalloys part 1.** Abdelazim, M.E.; Hammad, F.H. Nuclear Research Centre, Inshas (Egypt). 1990. 24p. Order Number DE95605761. Source: OSTI; NTIS (US Sales Only); INIS.

This is part I of the report titled 'the metallurgy of superalloys'. In this part the structure, phases and systems of superalloys are reviewed. The role of alloying elements in the design of superalloys and the mechanical properties of superalloys are also reviewed. Superalloys are important in high temperature technology, especially above 700 degree c. They are 'super' mainly because their creep and stress rupture resistances are very high. Superalloys are based on an austenitic matrix including secondary phases, mainly gamma precipitates, inter and intragranular carbides mainly M_{23} C_6 and M_6 C. They are classified into three systems, Ni-base, Fe-Ni base and Ce-base alloys. Different alloying elements mainly Cr, Mo, Al, Ti are added to increase the strength either by solid solution hardening (Cr, Mo, Al), precipitation hardening (A 1, Ti to produce gamma) or by dispersion hardening (Cr, Mo to form M_{23} C_6 and M_6 C carbides) and to increase the oxidation resistance (Cr, Al). 3 tab., 2 fig.

1102 (AREAEE–309) **The metallurgy of superalloys part 2.** Abdelazim, M.E.; Hammad, F.H. Nuclear Research Centre, Inshas (Egypt). 1990. 29p. Order Number DE95605762. Source: OSTI; NTIS (US Sales Only); INIS.

This is part II of the report titled 'the metallurgy of superalloys'. It deals with the effect of heat treatment and operating conditions (thermal exposure and environment) on the mechanical properties of superalloys. The heat treatment is important in the development of superalloys through that it controls type, amount, size shape and distribution of the precipitate and the grain size of the matrix. The thermal exposure leads to reduction in the amount of the primary carbides and to precipitation of secondary carbides. Also it leads to the agglomeration and coarsening of gamma or the transformation of gamma phase to phase. The environment may lead to the internal oxidation, carburization, decarburization or sulphidization of the superalloys which may result in the degradation of their mechanical properties. This part gives also an example of applications of superalloys in the field of nuclear reactors especially high temperature-gas cooled reactors. Joined with this part a table which contains the major superalloys including its chemical analysis, creep rupture strength and some of its applications. 1 tab.

1103 (CONF-9108260–1) **Low cycle fatigue at increased temperature under operating conditions.** Rie, K.T.; Klingelhoeffer, H. Technische Univ. Braunschweig (Germany). Inst. fuer Oberflaechentechnik und Plasmatechnische Werkstoffentwicklung. [1991]. 7p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0326335D. From 9. deformation and fracture symposium; Magdeburg (Germany); 28-30 Aug 1991. Order Number DE95708672. Source: OSTI; NTIS (US Sales Only).

High temperature low cycle fatigue experiments were carried out on Incoloy 800 H and AC 66 (14877) in air and in a steam coal gasification atmosphere. The results of the investigations are presented comparatively. Evaluation shows that the life results of AC 66 are at least comparable with those of the Incoloy 800 H. However, the materials have a different creep resistance and resistance to corrosion in the case of overlaid LCF stress. If one separates the three defect mechanisms at high temperature, one receives the following results: 1. Incoloy 800 H has a good stability against creep fatigue, but a low resistance to corrosion. 2. AC 66 on the other hand is very resistant against high temperature corrosion; its creep fatigue characteristics hardly differ from those of the Incoloy 800 h. In addition comparative experiments were carried out on Incoloy 800 H in air and flue gas. The experiments in flue gas showed a considerably lower life than in air. The damage effect in flue gas is apparently related to nitride formation. (orig./MM)

1104 (CONF-930802–21) **Static corrosion of construction materials exposed to superphosphoric acid made from various sources of phosphate rock.** Nguyen, D.T.; McDonald, C.L.; McGill, K.E. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 16p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–338). From 206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993. Order Number DE95001714. Source: OSTI; NTIS.

Corrosion tests were performed with various construction materials, such as carbon steel, cast iron, stainless steels, nickel and nickel-based alloys, copper and its alloys, aluminum alloy, zirconium alloy, and tantalum, exposed to wet-process superphosphoric acids (approximately 70% P_2O_5) from all the suppliers in the United States and to a technical-grade (55% P_2O_5) acid made by the electric furnace process. The study was conducted in response to reports from pipe-reactor users of excessive corrosion by superphosphoric acids and electric furnace acid. Test temperatures were ambient (approximately 21°C or 70°F), 66°C (150°F), and 93°C (200°F). Test results showed that temperature was a significant factor in acid corrosivity. Electric furnace acid was more corrosive than the superphosphoric acids. Carbon steel, cast iron, and aluminum alloy were not resistant to either the superphosphoric acids or the electric furnace acid. Nickel-chromium (Ni-Cr) and nickel-molybdenum (Ni-Mo) based alloys and tantalum exhibited adequate corrosion resistance in the superphosphoric acids and the electric furnace acid. Stainless steels performed well in all test acids at all test temperatures with some exceptions in the electric furnace acid at 93°C. Zirconium alloy, copper and its alloys, pure nickel, and Monel 400 provided adequate corrosion resistance to all test acids at ambient temperature only.

1105 (CONF-930802–22) **An update of corrosion inhibitors for mild steel exposed to 32-0-0 UAN solution.** Nguyen, D.T. (Tennessee Valley Authority, Muscle Shoals, AL (United States)); Nichols, D.E.; Lohry, E.J. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 21p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–337). From 206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993. Order Number DE95001715. Source: OSTI; NTIS.

This is a continuation of corrosion studies on the effectiveness of commercial and newly-developed corrosion inhibitors for use with mild steel exposed to urea-ammonium nitrate (UAN) solution. This paper provides updated information on five newly-developed corrosion inhibitors. Tests were conducted with mild steel exposed to 32-0-0 UAN solution containing each corrosion inhibitor at ambient temperature and under static conditions. Real-time corrosion of the test specimens was monitored using AC impedance techniques. Corrosion performance of the inhibitors was evaluated based on comparison of the corrosion rate of specimens exposed to 32-0-0 UAN solution with and without a corrosion inhibitor.

1106 (CONF-940704–4) **Computational modeling of diffusion-controlled transformations in ternary systems.** Vitek, J.M.; Vitek, S.A.; David, S.A. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on solid-to-solid phase transformations in organic materials; Pittsburgh, PA (United States); 17-22 Jul 1994. Order Number DE95001358. Source: OSTI; NTIS; GPO Dep.

The diffusion-controlled solid-state transformation between two phases in a ternary system was modeled using an implicit finite difference method. The one-dimensional system that was modeled was of finite size, and the interface the two phases was allowed to move. Equilibrium at the interface was assumed, and a grid that moved with the interface was utilized. The calculations were applied to the iron-nickel-chromium ternary system to model the growth or dissolution of ferrite in an austenitic stainless steel weld at elevated temperatures. The equilibrium conditions at the interface were specified with the aid of the ThermoCalc™ software program that was used to calculate tie-line compositions as a function of overall alloy composition and temperature. Appropriate parameters for the analysis were chosen based on an earlier

parametric study. Calculations were made for the isothermal transformation kinetics over a range of temperatures from 973 to 1573 K, in which the behavior varied from complete dissolution of the ferrite to growth of ferrite at the expense of austenite. The variation in ferrite size and composition often was quite complicated and frequently did not follow a direct path from the initial condition to the final equilibrium. Additional calculations were carried out for non-isothermal aging at constant cooling rates from 1573 to 973 K. The computational routine can be applied to any diffusion-controlled transformation in a ternary system with any thermal history, provided suitable data for the equilibrium at the interface is available.

1107 (CONF-9409227–1) **Plastic deformation of ordered intermetallic alloys: Fundamental aspects.** Yoo, M.H. (Max-Planck-Inst. fuer Eisenforschung, Duesseldorf (Germany)). Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States);Alexander von Humboldt-Stiftung, Bonn (Germany). DOE Contract AC05-84OR21400. From 6. international symposium on plasticity of metals and alloys; Prague (Czech Republic); 5-9 Sep 1994. Order Number DE95001070. Source: OSTI; NTIS; GPO Dep.

Fundamental aspects of plastic deformation in ordered intermetallic alloys are reviewed by directly comparing the temperature-dependent yield stresses of Ni_3Al and Ni_3Si (the $L1_2$ structure), NiAl and FeAl (the B2 structure), and TiAl and Ti_3Al (non-cubic $L1_0$ and $D0_{19}$ structures, respectively). While the yield strength anomaly observed in Ni_3Al is consistent with the prevailing dislocation models, that found in stoichiometric Ni_3Si is not. The strong plastic anisotropy observed in NiAl stems from the high antiphase boundary energy, and that found in two-phase γ-TiAl/α_2-Ti_3Al is due to the exceptionally high compressive yield strength along the c-axis of Ti_3Al.

1108 (DOE/ER/45166–6) **The effect of elastic stress on Ostwald Ripening Phenomena: Final report, August 1, 1990–July 31, 1993.** Johnson, W.C. (Univ. of Virginia, Charlottesville, VA (United States). Dept. of Materials Science and Engineering). Carnegie-Mellon Univ., Pittsburgh, PA (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER45166. Order Number DE95002599. Source: OSTI; NTIS; GPO Dep.

The purpose of this research program is to understand the influence of elastic misfit strain and applied stress on the development of microstructure in two-phase coherent alloys. The long-term goal of this research is to identify those material parameters that promote microstructural stability in multiphase systems at elevated temperatures. The authors efforts have been focussed on two fronts. First, they have developed a methodology and the corresponding code to simulate the three-dimensional coarsening behavior of elastically and diffusionally interacting spherical particles in an infinite matrix. Secondly, they have completed a set of experiments using model ternary Ni-Al-Mo alloys that were designed to provide quantitative data on symmetry-conserving and symmetry-breaking precipitate shape transitions and particle coarsening kinetics for a critical check on the theory and computer simulations.

1109 (DOE/ER/45184–10) **The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994.** Was, G.S. Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering. Jul 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-85ER45184. Order Number DE95002941. Source: OSTI; NTIS; GPO Dep.

In the past year, progress has been made in several areas. Creep tests conducted in both primary water at controlled potentials and in inert argon show that the water environment provides an enhancement in creep rate by a factor of 5–10 over that in argon, regardless of the applied potential. Cracking is most severe in the water tests, but correlates best with the amount of creep strain, supporting a creep damage accumulation model. Creep experiments on carbon doped heats of Ni-16Cr-9Fe support earlier findings that the creep rate and the amount of IG cracking are strong functions of the amount of carbon in solution. Experiments on two heats containing the same amount of carbon in solution, but one of which contains grain boundary carbides show that carbides are ineffective in preventing Ig cracking if the amount of carbon in solution is low. Grain boundary misorientation studies confirm that thermal treatments which produce a larger proportion of CSL boundaries exhibit significantly lower creep rates (by 10x) and have a higher yield strength (by 25 MPa). In support of these studies, an electron backscattering patterns (EBSP) imaging system for use in an environmental scanning electron microscope (ESEM) has just recently been completed to provide determination of grain boundary misorientation on small grain (30 μm) samples. In addition, a multiple constant load test (MCLT) system has just been completed to provide for the simultaneous and independent creep testing of up to 3 samples in high temperature water.

1110 (DOE/ER/54186–T3) **Incology alloy 908 data handbook.** Toma, L.S. (Massachusetts Institute of Technology, Cambridge, MA (United States)); Steeves, M.M.; Reed, R.P. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. Mar 1994. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC02-93ER54186. (PFC/RR–94-2). Order Number DE95001818. Source: OSTI; NTIS; INIS; GPO Dep.

This handbook is a compilation of all available properties of Incoloy alloy 908 as of March, 1994. Data included in this paper cover mechanical, elastic, thermal and magnetic characteristics. The mechanical properties include tensile, fracture toughness, fatigue, and stress-rupture for both the base metal and related weld filler metals. Elastic properties listed are Young's, shear and bulk moduli and Poisson's ratio. Thermal expansion, thermal conductivity and specific heat and magnetization are also reported. Data presented are summarized in the main body and presented in detail in the supplements. Areas of ongoing research are briefly described, and topics for future research are suggested. The data have been compiled to assist in the design of large-scale superconducting magnets for fusion reactors.

1111 (DOE/ID/12847–7) **AISI Direct Steelmaking Program: Final technical report.** Aukrust, E. American Iron and Steel Inst., Pittsburgh, PA (United States). Aug 1994. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-89ID12847. Order Number DE94017940. Source: OSTI; NTIS; GPO Dep.

This final report deals with the results of a 5-yr project for developing a more energy-efficient, environmentally friendly, less costly process for producing hot metal than current coke ovens and blast furnaces. In the process, iron ore pellets are smelted in a foamy slag created by reaction of coal char with molten slag to produce CO. The CO further reacts with oxygen, which also reacts with coal volatile matter, to produce the heat necessary to sustain the endothermic reduction reaction. The uncombusted CO and H_2 from the coal are used to preheat and prereduce hematite pellets for the most efficient use of the energy in the coal. Laboratory programs confirmed that the process steps worked. Pilot plant studies were successful. Economic analysis for a 1 million tpy plant is promising.

1112 (DOE/ID/13233–T1) **Improved die castings through plasma surface modification, improved sensors and die soldering prevention: Quarterly progress report 1, July 1–September 30, 1994.** Mobley, C.; Brevick, J. Ohio State Univ., Columbus, OH (United States). Center for Die Casting. 17 Oct 1994. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-94ID13233. Order Number DE95002238. Source: OSTI; NTIS; GPO Dep.

This quarterly report covers activities of the Die Casting Research project during the period July 1, 1994 through September 30, 1994, at The Ohio State University. The objective of the Die Casting Research project is to enhance the competitiveness of the US die casting industry. To accomplish this objective, the Center for Die Casting at The Ohio State University shall perform tasks that focus on three general areas: the application of plasma surface modifications to aluminum and zinc casting dies; the development and evaluation of systems to monitor temperature, pressure, and gas content of die casting cavities; and the determination of causes of die soldering in zinc die castings. This quarterly report covers work on Task 2 – Commercial Sensor Evaluation.

1113 (ECN-RX–93-082) **Assessment of vanadium alloys for ITER application.** Borgstedt, H.U.; Clemens, H.; Ehrlich, K.; Fromm, E.; Kelzenberg, S.; Moeslang, A.; Pick, M.; Ruehle, M.; Schaaf, B. van der; Schaefer, L.; Schiller, P.; Schirra, M.; Witwer, M.; Witzenburg, W. van; Zolti, E.; Zucchetti, M. Netherlands Energy Research Foundation (ECN), Petten (Netherlands). Sep 1993. 66p. (CONF-9304267–: 3. EC blanket/structural materials meeting, Petten (Netherlands), 29 Apr 1993). Order Number DE95711438. Source: OSTI; NTIS; INIS.

The assessment effort concerned required evaluation of various relevant properties of vanadium alloys. The outcome predictably shows that these properties, as well as timing, funding, manufacturing and licensing aspects, each set their own specific boundary conditions for application of these alloys in ITER. Some of these are not really felt as constraints. Their capacity to accommodate high heat loads, for example, is better than other candidate materials and appears to be the main reason for the present interest in these alloys. Other favourable properties include neutronic properties (low nuclear heating rates, good tritium breeding performance and low helium generation rates), intrinsically low activation, excellent tensile and creep properties up to high temperatures and high strength-to-density ratio. Not all of these properties necessarily are relevant for ITER, but they would be important for longer term application. (orig.)

1114 (ETDE/DE-mf–95708589) **Defects in multicrystalline silicon for solar cells: Defect behavior under heat treatment: Final report.** Kittler, M.; Seifert, W. Institut fuer Halbleiterphysik GmbH, Frankfurt an der Oder (Germany). 28 Jun 1993. 13p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0329107F. Order Number DE95708589. Source: OSTI; NTIS (US Sales Only).

The project was to provide information on the behavior and the characteristics of defects in multicristalline silicon. In this way, it should provide the preconditions for the improvement of the efficiency of solar cells. Investigation methods were EBIC and TEM. Investigated was material which was produced by casting, both in the initial state and after different treatments as well as solar cells. The results relate to: The dependence of the minority substrate diffusion length on defect density and structure; the getter characteristics of the defects; the role of segregations; the relationship between the structure of grain boundaries and their recombination activity; potential barriers to grain boundaries and related liked effects. It is reported on preparation influences on recombination behavior of the defects. The importance of temperature dependent EBIC investigations for the defect characterization is presented. (orig.)

1115 (ETDE/DE-mf–95711729) **Plasma-indued separation of amorphous siliced separation of amorphous silicon from silane: From the understanding of the hemichemical reation mection mechanism to separation of valuable amorphous silion with great rates of deposition.** Ambacher, O. Technische Univ. Muenchen (Germany). Fakultaet fuer Chemie, Biologie und Geowissenschaften. 19 Feb 1993. 139p. (In German). Order Number DE95711729. Source: OSTI; NTIS (US Sales Only).

Based on knowledge of the dominant steps of chemical reactions in the gas phase of the corona and at the substrate surface in the separation of a-Si:H from silane, the deposition efficiency and optoelektronic properties of the hydrogenated amorphous silicon produced were optimized. From new results of relaxation, local and time-resolved mass spectrometry, and by deposition experiments, the chemical reaction mechanism, the formation of disilane and trisilane in the gas phase and their decomposition at the substrate surface were better understood. It was shown that disilane and trisilane are the reactive species which permit the deposition of valuable amorphous silicon with high rates of separation. It was also proved experimentally that a manufacturing process optimized for maximum disilane and trisilane concentration make separation of a-Si:H with rates of deposition of up to 29 A/s possible without the formation of clusters in the gas phase of the corona. (orig./MM)

1116 (ETDE/DE-mf–95711740) **Corrosion investigations on austenite chromium/nickel steels by electrochemical methods and photoelectron spectrometry.** Gaertner, R. Marburg Univ. (Germany). Fachbereich 15 - Chemie. 16 Feb 1993. 115p. (In German). Order Number DE95711740. Source: OSTI; NTIS (US Sales Only).

The corrosion stability of austenitic CrNi steels 1.4301 and 1.4571 was investigated by electrochemical methods and by photoelectron spectrometry. Test pieces were exposed to pH-neutral solutions of nitrate, sulfate, fluoride and chloride in concentrations of $c = 10^{-3}$ to $c = 10^{-1}$ mol/L and at temperatures of 20 - 70 C in order to simulate the corrosion characteristics of these materials in service water and drinking water. In all cases, the stability of the materials with respect to the electrolyte solutions was reduced at higher temperatures. The corrosion-inhibiting effect of nitrate and sulfate anions was observed at higher concentrations, while the destructive effect of fluoride solutions was reflected in uniform corrosion and in the formation of surface layers. The test pieces exposed to chloride ions exhibited the most pronounced corrosion effects in the form of pitting and crevice corrosion. The alloy with the lowest molybdenum content had the lowest stability when exposed to the electrolyte solutions. (orig./MM)

1117 (ETDE/DE-mf–95711760) **Inhibition of sulfide growth on iron by means of alloying elements and by means of carbon deposition in the gaseous phase: Final report.** Wegge, S.; Grabke, H.J. Max-Planck-Institut fuer Eisenforschung GmbH, Duesseldorf (Germany). 1991. 103p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 11E111. Order Number DE95711760. Source: OSTI; NTIS (US Sales Only).

In some technical processes of the petroleum industry, formation of a FeS protective layer has been observed in low-alloy or unalloyed steels. The present investigation focussed on the mechanisms of FeS growth in realistic pressure and temperature conditions. Attempts were made to delay the growth of FeS in sulfidizing gas atmospheres with low oxygen partial pressures. (orig./BBR)

1118 (ETDE/DE-mf–95711804) **Evaluation of mechanical and technological parameters of different material states by nondestructive micro- and macro-magnetic measuring quantities as well as ultrasonic techniques (2nd part of the project): Final report.** Deimel, P.; Burr, W.; Fischer, H.; Kuppler, D.; Sattler, E. Stuttgart Univ. (Germany). Staatliche Materialpruefungsanstalt. Dec 1991. 263p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 1500748. Order Number DE95711804. Source: OSTI; NTIS (US Sales Only).

The microstructural parameters required for calculating the J integral J_i for crack initiation were determined for five different materials. These parameters are, e.g.: Type, size, density and pattern of precipitations and nonmetallic inclusions. In addition, the density and patterns of dislocations were determined for the purpose of calculating the yield point, and the volume fractions of precipitation were calculated. The toughness of higher match impact strengths was determined by tensile tests whose characteristic data are required for calculating J_i and the yield point. The crack resistance curve (J_i-R curve) and the A_V-T curve were determined. Scanning electron miscroscope analyses were carried out additionally on test pieces deformed in the tensile test. The following materials were investigated: The conventionally produced high-temperature material X 20 CrMoV 12 1, thermally aged X 20 CrMoV 12 1, shape-welded 10 MnMoNi 5 5, and two variants of 20 MnMoNi 5 5 with different sulphur concentrations of 0.011% and 0.020%. (orig.)

1119 (INIS-JP–018, pp. 945-952) **Impact-limiting materials characterization.** Glass, R.E. (Sandia National Lab., Albuquerque, NM (United States)); Duffey, T.A.; McConnell, P. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

Three types of impact-limiting materials have been characterized which have applications in packages for the transport of radioactive materials. These materials are aluminum honeycombs,

polyurethane foams, and aluminum foams. The results of the materials characterization have indicated strengths and weaknesses for each type of material. The polyurethane foams provide good impact limiting ability and excellent thermal insulation. However, they burn when subjected to the regulatory thermal event in the presence of air. The aluminum honeycombs provide excellent impact resistance in specific impact orientations. However, they provide relatively poor resistance to thermal assault. Finally, the aluminum foams exhibit relatively poor impact energy absorption capacities, significant variability in energy absorption, and limited thermal insulation. The development of the figures of merit examined the response of the materials to the impact event with the intent of maximizing the energy absorption of the materials with respect to either the volume or mass of the materials. Three figures of merit will be presented for the structural response. The figure of merit for the thermal event is based on minimizing the heat flux to the containment boundary. The paper presents a discussion of the test methods, a summary of the data and the figures of merit for each material. (J.P.N.).

1120 (INIS-mf–14386, pp. TM06) **Fabrication and properties of long Bi2223 Ag-sheathed superconducting tapes.** Dou, S.X. (Wollongong Univ., Wollongong, NSW (Australia). Centre for Superconducting and Electronic Materials); Liu, H.K.; Bhasale, R.; Hu, Q.Y.; Yau, J.; Ionescu, M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. BISMUTH COMPLEXES/electrical properties; BISMUTH COMPLEXES/mechanical properties; SUPERCONDUCTING DEVICES/bismuth complexes; SUPERCONDUCTING DEVICES/fabrication; ACTIVATION ENERGY; HIGH-TC SUPERCONDUCTORS; SHEETS; SILVER; FABRICATION

1121 (INIS-mf–14386, pp. WP25) **High coercive $Sm_2Fe_{17}N_x$ powders prepared by HDDR.** Wenhausen, P.A.P. (Santa Catarina Univ., Florianopolis, SC (Brazil)); Dempsey, N.M.; Gebel, B.; Mueller, K.H. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SAMARIUM ALLOYS/coercive force; SAMARIUM ALLOYS/phase transformations; DESORPTION; GRAIN SIZE; HYDROGENATION; IRON NITRIDES; POWDER METALLURGY; PRESSURE DEPENDENCE; RECOMBINATION; TEMPERATURE DEPENDENCE

1122 (INIS-mf–14386, pp. WP04) **An investigation of preferential sputtering from single-phase α-and β- Cu/Zn alloys.** Oliver, D.R. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Finlayson, T.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. COPPER BASE ALLOYS/sputtering; ZINC BASE ALLOYS/sputtering; ABSORPTION SPECTROSCOPY; SPUTTERING; CRYSTAL STRUCTURE; PHASE STABILITY; SURFACE COATING

1123 (INIS-mf–14386, pp. WP06) **Diffuse neutron scattering studies of single crystal specimens of Fe_{3-x} Mn_x Si.** Ersez, T. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Hicks, T.J.; Kennedy, S.J.; Kepa, H. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CRYSTAL STRUCTURE/neutron diffraction; IRON ALLOYS/crystal structure; IRON ALLOYS/manganese alloys; CROSS SECTIONS; MAGNETIC MOMENTS; MONOCRYSTALS; SILICON ALLOYS; SPIN FLIP; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE DEPENDENCE

1124 (INIS-mf–14386, pp. WP09) **Phase formation at the Fe-rich end of Dy-Fe-Ti system.** Xu, Jianmin (Wollongong Univ., Wollongong, NSW (Australia). Centre for Superconducting and Electronic Materials); Liu, H.K.; Dou, S.X.; Li, Hongshuo; Cadogan, J.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. DYSPROSIUM ALLOYS/crystal-phase transformations; DYSPROSIUM ALLOYS/iron alloys; CERIUM ALLOYS; CRYSTALLOGRAPHY; CURIE POINT; ORTHORHOMBIC LATTICES; SCANNING ELECTRON MICROSCOPY; SPACE GROUPS; STRUCTURAL CHEMICAL ANALYSIS; TETRAGONAL LATTICES; TITANIUM ADDITIONS; X-RAY DIFFRACTION

1125 (INIS-mf–14386, pp. WP41) **The initial thermoinstability of the Al-Cu-Mg-Ag supersaturated solid solution.** Lim, M. (Monash Univ., Clayton, VIC (Australia). Dept. of Materials Engineering); Rossiter, P.L.; Tibballs, J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ALUMINIUM BASE ALLOYS/nucleation; ALUMINIUM BASE ALLOYS/phase studies; NUCLEATION/thermodynamic model; NUCLEATION; COPPER ALLOYS; CRYSTAL LATTICES; MAGNESIUM ALLOYS; PHASE TRANSFORMATIONS; QUENCH AGING; QUENCH HARDENING; SILVER ADDITIONS; T CODES

1126 (INIS-mf–14386, pp. WP69) **A study of the Cu_3 Au(110) surface using low energy ion scattering.** Zhang, F.M. (Newcastle Univ., NSW (Australia). Dept. of Physics); Shen, Y.G.; King, B.V.; O'Connor, D.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. COPPER ALLOYS/electron diffraction; COPPER ALLOYS/gold complexes; ELECTRON DIFFRACTION/ion scattering analysis; DIFFUSION; PENETRATION DEPTH; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0273-0400 K

1127 (INIS-mf–14386, pp. WP75) **Determination of the deuterium order-disorder structure transition in Pd-$DO_{.65}$ at '50K'.** Kennedy, S.J. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Applied Nuclear Physics Program); Wu, E.; Gray, E.M.; Kisi, E.H.; Kennedy, B.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. DEUTERIUM/order-disorder transformations; PALLADIUM HYDRIDES/deuterium; PALLADIUM HYDRIDES/neutron diffraction; ATOMIC DISPLACEMENTS; CRYSTAL LATTICES; CRYSTAL STRUCTURE; CRYSTALLOGRAPHY; DEUTERIUM; SPACE GROUPS; TEMPERATURE RANGE 0013-0065 K

1128 (INIS-mf–14386, pp. TM02) **Edge phonoconductivity in a magnetically quantised two-dimensional electron gas.** Kent, A.J. (Nottingham Univ. (United Kingdom)). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRON GAS/phonons; ELECTRON GAS/scattering; GALLIUM ARSENIDES/electron-phonon coupling; ACOUSTIC ESR; PHONONS; SCATTERING; HALL EFFECT; MAGNETIC FIELDS; TWO-DIMENSIONAL CALCULATIONS

1129 (INIS-mf–14386, pp. TM03) **The freezing of 2D electron liquid in a random potential.** Thakur, J.S. (New South Wales Univ., Kensington, NSW (Australia). School of Physics);

Neilson, D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRON GAS/solidification; GALLIUM ARSENIDES/electron gas; ALUMINIUM; ANALYTIC FUNCTIONS; CRYSTAL DEFECTS; SOLIDIFICATION; GLASS; NONLINEAR PROBLEMS; PHASE TRANSFORMATIONS; SEMICONDUCTOR MATERIALS; TWO-DIMENSIONAL CALCULATIONS

1130 (INIS-mf–14386, pp. WP01) **Thermal expansion of V_3 Si with controlled martensite-phase morphology.** Liu, M. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Finalayson, T.R.; Smith, T.F. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. VANADIUM ALLOYS/silicon alloys; VANADIUM ALLOYS/thermal expansion; CRYSTAL-PHASE TRANSFORMATIONS; MARTENSITE; MICROSTRUCTURE; TEMPERATURE DEPENDENCE

1131 (INIS-mf–14386, pp. WP08) **Magnetic properties of novel ternary phase: Sm_3 $(Fe_{1-x}$ $Tl_x)_{29}$ $(0.04 \leq x \leq 0.06)$.** Li, Hongshuo (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Cadogan, J.M.; Hu, Boping; Yang, Fuming; Nasunjilegal, B.; Xu, Jianmin; Liu, H.K.; Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. SAMARIUM ALLOYS/magnetization; ANISOTROPY; CRYSTAL STRUCTURE; CURIE POINT; IRON BASE ALLOYS; PHASE STUDIES; MAGNETIZATION; SCANNING ELECTRON MICROSCOPY; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE RANGE 0400-1000 K; TITANIUM BASE ALLOYS; X-RAY DIFFRACTION

1132 (INIS-mf–14386, pp. WP12) **Magnetic properties of nano-materials of Sm_3 $(Fe_{1-x}$ $Tl_x)_{29}$ $(0.04 \leq x \leq 0.06)$.** Reza, K.A. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Li, Hongshuo; Cadogan, J.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SAMARIUM ALLOYS/hyperfine structure; SAMARIUM ALLOYS/magnetic properties; IRON ADDITIONS; IRON 57; MOESSBAUER EFFECT; SCANNING ELECTRON MICROSCOPY; TITANIUM ADDITIONS; X-RAY DIFFRACTION

1133 (INIS-mf–14386, pp. WP14) **Magnetic properties of a novel Pr-Fe-Tl phase.** Li, Hongshuo (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Cadogan, S.J.M.; Bowden, G.J.; Xu, Jianmin; Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. PRASEODYMIUM ALLOYS/magnetic properties; PRASEODYMIUM ALLOYS/moessbauer effect; ANNEALING; IRON ALLOYS; IRON 57; SCANNING ELECTRON MICROSCOPY; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE DEPENDENCE; TITANIUM ALLOYS; TRIGONAL LATTICES; X-RAY DIFFRACTION

1134 (INIS-mf–14386, pp. WP15) **The magnetic properties of Gd $(Fe_{1-x}$ $Co_x)_9$ Tl_2 alloys.** Cadogan, S.J.M. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Li, Hongshuo; Bowden, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. GADOLINIUM ALLOYS/magnetic properties; GADOLINIUM ALLOYS/moessbauer effect; COBALT ALLOYS; CURIE POINT; HYPERFINE STRUCTURE; IRON ALLOYS; IRON 57; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE RANGE 0065-0273 K; TETRAGONAL LATTICES; TITANIUM ALLOYS; X-RAY DIFFRACTION

1135 (INIS-mf–14386, pp. WP29) **Magnetic properties of Er Co_{12} B_6:^{57} Fe.** Cadogan, J.M. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); cmpbell, S.J.; Zhao, X.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. ERBIUM ALLOYS/magnetic properties; MAGNETIC PROPERTIES/moessbauer effect; BORON ALLOYS; COBALT ALLOYS; CRYSTAL LATTICES; DOPED MATERIALS; FERROMAGNETISM; IRON 57; ORDER-DISORDER TRANSFORMATIONS; SPACE GROUPS; SPIN ORIENTATION

1136 (INIS-mf–14386, pp. WP68) **Ion beam mixing of isotopic bilayers.** Fell, C.J. (Newcastle Univ., NSW (Australia). Dept. of Physics). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ION CHANNELING/physical radiation effects; NICKEL 58/ion channeling; NICKEL 58/thin films; NICKEL 60/ion channeling; NICKEL 60/thin films; CRYSTAL GROWTH; ELECTRON DIFFRACTION; ION BEAMS; IRRADIATION; LATTICE PARAMETERS; LAYERS; MASS SPECTROSCOPY; MIXING; RUTHERFORD SCATTERING; STRUCTURAL CHEMICAL ANALYSIS

1137 (INIS-mf–14386, pp. WP48) **Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures.** Lumpkin, N.E. (Commonwealth Scientific and Industrial Research Organization, Epping, NSW (Australia). Div. of Radiophysics); Lumpkin, G.R.; Butcher, K.S.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. HETEROJUNCTIONS; ELECTRIC CONTACTS; GALLIUM ARSENIDES/electric contacts; GALLIUM ARSENIDES/thin films; THIN FILMS/structural chemical analysis; HETEROJUNCTIONS; ELECTRIC CONDUCTIVITY; ELECTRON MICROSCOPY; FABRICATION; GERMANIUM ALLOYS; GOLD ALLOYS; MICROSTRUCTURE; NICKEL ALLOYS; OPTIMIZATION; PHASE STUDIES; SURFACE PROPERTIES

1138 (INIS-mf–14386, pp. WP23) **Structural and magnetic properties of Nd $Ni_{8.6-x}$ Fe_x $Si_{2.4}$.** Harker, S.J. (Univ. of New South Wales, Australian Defence Force Academy, canberra, ACT (Australia). Dept. of Physics); Campbell, S.J.; Cadogan, J.M.; Li, Hongshuo. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. IRON ALLOYS/magnetic properties; IRON ALLOYS/structural chemical analysis; NEODYMIUM ALLOYS/magnetic properties; NEODYMIUM ALLOYS/structural chemical analysis; NICKEL ALLOYS/magnetic properties; NICKEL ALLOYS/structural chemical analysis; SILICON ALLOYS/magnetic properties; SILICON ALLOYS/structural chemical analysis; ANNEALING; DOPED MATERIALS; IRON 57; MOESSBAUER EFFECT; SPIN ORIENTATION; SYNTHESIS; X-RAY DIFFRACTION

1139 (INIS-mf–14393, pp. 92-93) **Computer simulation of binary alloy structure in the Ising model scheme.** Starosta, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland).

[1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. CRYSTAL STRUCTURE/binary alloy systems; CRYSTAL STRUCTURE/computerized simulation; ISING MODEL

1140 (INIS-mf–15044) **Numerical description of creep of highly creep resistant alloys.** Preussler, T. Technische Hochschule Darmstadt (Germany). Fachbereich 16 - Maschinenbau. 1991. 230p. (In German). Order Number DE95711739. Source: OSTI; NTIS (US Sales Only); INIS.

Fatigue tests have been performed with a series of highly creep resistant materials for gas turbines and related applications for gaining better creep data up to long-term behaviour. The investigations were performed with selected individual materials in the area of the main applications down to strains and stresses relevant to design, and have attained trial durations of 25000 to 60000 h. In continuing former research, creep equations for a selection of characterizing individual materials have been improved and partly newly developed on the basis of a differentiated evaluation. Concerning the single materials, there are: one melt each of the materials IN-738 LC, IN-939, IN-100, FSX-414 and Inconel 617. The applied differentiated evaluation is based on the elastoplastical behaviour from the hot-drawing test, the creep behaviour from the non interrupted or the interrupted fatigue test, and the contraction behaviour from the annealing test. The creep equations developed describe the high temperature deformation behaviour taking into account primary, secondary and partly the tertiary creep dependent of temperature, stress and time. These equations are valid for the whole application area of the respective material. (orig./MM)

1141 (INIS-UA–005, pp. 57-60) **Particularities of copper structure state after low-temperature recrystallization.** Aksenov, V.K. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Starodubov, Ya.D. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Structure state formed in result of long-term ($\approx$ 1 year) low-temperature (300 K) annealing of copper which was preliminarily rolled at 20 K was studied. It was shown that a considerable number of structure elements which are typical for rotation plasticity was observed after annealing. Possible influence of collective dislocation movement processed on the development of recrystallization under crystal lattice distortion conditions and relatively low level of thermal activation is discussed.

1142 (INIS-UA–005, pp. 61-63) **Temperature dependence of displacement module and internal friction in Ga As monocrystals.** Okovit, V.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Starodubov, Ya.D.; Kovtun, G.P.; Chirkina, L.A. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Temperature dependence of damping decrement and displacement module in the 4,2...300 K temperature range for Ga As monocrystals of <111>,<110> and <100> orientations was measured. Two peaks of internal friction with maxima at 180 and 250 K and 0,17 and 0,43 eV activation energy were observed. The internal friction peak at 250 K is typical for all orientations. It was shown that displacement module in the 4,2...300 K range is practically independent on temperature, but at temperature higher than 180 K it decreases.

1143 (IS-M–795) **A new universal solution for the electrofinishing of metallic materials.** Ellis, T.W.; Lograsso, T.A.; Hilsenbeck, S.; Sailsbury, H.E. Ames Lab., IA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9410184–4: The Metallurgical Society (TMS) conference on high performance composites, Rosemont, IL (United States), 10-15 Oct 1994). Order Number DE95001681. Source: OSTI; NTIS; GPO Dep.

A new reagent has been applied to the electrofinishing of metallic materials for metallographic preparation and surface cleaning. The development of this reagent was in response to the safety, health and disposal problems associated with the use of perchloric acid based solutions. This procedure has been applied to metallic materials that are very difficult to electrofinish, e.g., rare earths, Ti, $Nd_2Fe_{14}B$, Pb, and intermetallic alloys. Both the procedure and results of electrofinishing will be discussed.

1144 (IS-M–796) **Methods and opportunities in the recycling of rare earth based materials.** Ellis, T.W.; Schmidt, F.A.; Jones, L.L. Ames Lab., IA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9410184–5: The Metallurgical Society (TMS) conference on high performance composites, Rosemont, IL (United States), 10-15 Oct 1994). Order Number DE95001680. Source: OSTI; NTIS; GPO Dep.

Rare Earth based materials are increasingly being utilized in industrial and commercial practice. Large volume production of permanent magnet materials, $Nd_2Fe_{14}B$, $SmCo_5$, Sm_2Co_{17}, and rechargeable Ni/Metal Hydride batteries, $LaNi_5$, has increased the amount of rare earth based materials in the waste stream. Both for economic and environmental reasons, recycling and reuse of all materials is desirable. Unfortunately, the recycling methodology for these materials is in its infancy. In this paper the present "state of the art", in recycling of rare earth based materials will be discussed. Additionally, new methods which alleviate many of the concerns of present aqueous based recycling technology will be presented.

1145 (IS-T–1538) **Magnetization and magnetostriction in highly magnetostrictive materials.** Thoelke, J.B. Ames Lab., IA (United States). 26 May 1993. 145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001664. Source: OSTI; NTIS; INIS; GPO Dep.

The majority of this research has been in developing a model to describe the magnetostrictive properties of Terfenol-D, $Tb_{1-x}Dy_xFe_y$ (x = 0.7-0.75 and y = 1.8–2.0), a rare earth-iron alloy which displays much promise for use in device applications. In the first chapter an introduction is given to the phenomena of magnetization and magnetostriction. The magnetic processes responsible for the observed magnetic properties of materials are expiained. An overview is presented of the magnetic properties of rare earths, and more specifically the magnetic properties of Terfenol-D. In the second chapter, experimental results are presented on three composition of $Tb_{1-x}Dy_xFe_y$ with x = 0.7, y= 1.9, 1.95, and x= 0.73, y= 1.95. The data were taken for various levels of prestress to show the effects of composition and microstructure on the magnetic and magnetostrictive properties of Terfenol-D. In the third chapter, a theoretical model is developed based on the rotation of magnetic domains. The model is used to explain the magnetic and magnetostrictive properties of Terfenol-D, including the observed negative strictions and large change in strain. The fourth chapter goes on to examine the magnetic properties of Terfenol-D along different crystallographic orientations. In the fifth chapter initial data are presented on the time dependence of magnetization in nickel.

1146 (IS-T–1689) **Theoretical study of the noble metals on semiconductor surfaces and Ti-base shape memory alloys.** Ding, Yungui. Ames Lab., IA (United States). 27 Jul 1994. 122p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-82. Grant DMR-8819379. Order Number DE95001654. Source: OSTI; NTIS; INIS; GPO Dep.

The electronic and structural properties of the ($\sqrt{3} \times \sqrt{3}$) R30° Ag/Si(111) and ($\sqrt{3} \times \sqrt{3}$) R30° Au/Si(111) surfaces are investigated using first principles total energy calculations. We have tested almost all experimentally proposed structural models for both surfaces and found the energetically most favorable model for each of them. The lowest energy model structure of the ($\sqrt{3} \times \sqrt{3}$) R30° Ag/Si(111) surface consists of a top layer of Ag atoms arranged as "honeycomb-chained-trimers" lying above a distorted "missing top layer" Si(111) substrate. The coverage of Ag is 1 monolayer (ML). We find that the honeycomb structure observed in STM images arise from the electronic charge densities of an empty surface band near the Fermi level. The electronic density of states of this model gives a "pseudo-gap" around the Fermi level, which

is consistent with experimental results. The lowest energy model for the ($\sqrt{3} \times \sqrt{3}$) R30° Au/Si(111) surface is a conjugate honeycomb-chained-trimer (CHCT-1) configuration which consists of a top layer of trimers formed by 1 ML Au atoms lying above a "missing top layer" Si(111) substrate with a honeycomb-chained-trimer structure for its first layer. The structures of Au and Ag are in fact quite similar and belong to the same class of structural models. However, small variation in the structural details gives rise to quite different observed STM images, as revealed in the theoretical calculations. The electronic charge density from bands around the Fermi level for the ($\sqrt{3} \times \sqrt{3}$) R30°, Au/Si(111) surface also gives a good description of the images observed in STM experiments. First principles calculations are performed to study the electronic and structural properties of a series of Ti-base binary alloys TiFe, TiNi, TiPd, TiMo, and TiAu in the B2 structure.

1147 (Juel–2907) **Implementation of a structural dependent model for the superalloy IN738LC in ABAQUS-code.** Wolters, J. (Technische Hochschule Aachen (Germany). Fakultaet fuer Maschinenwesen); Betten, J.; Penkalla, H.J. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Werkstoffe der Energitechnik; Technische Hochschule Aachen (Germany). Fakultaet fuer Maschinenwesen. May 1994. 126p. (In German). Order Number DE95715733. Source: OSTI; NTIS (US Sales Only); INIS.

Diplomarbeit submitted by J. Wolters.

Superalloys, mainly consisting of nickel, are used for applications in aerospace as well as in stationary gas turbines. In the temperature range above 800 C the blades, which are manufactured of these superalloys, are subjected to high centrifugal forces and thermal induced loads. For computer based analysis of the thermomechanical behaviour of the blades models for the stress-strain behaviour are necessary. These models have to give a reliable description of the stress-strain behaviour, with emphasis on inelastic affects. The implementation of the model in finite element codes requires a numerical treatment of the constitutive equations with respect to the given interface of the used code. In this paper constitutive equations for the superalloy IN738LC are presented and the implementation in the finite element code ABAQUS with the numerical preparation of the model is described. In order to validate the model calculations were performed for simple uniaxial loading conditions as well as for a complete cross section of a turbine blade under combined thermal and mechanical loading. The achieved results were compared with those of additional calculations by using ABAQUS, including Norton's law, which was already implemented in this code. (orig.)

1148 (Juel–2914) **Manipulation of growth mode in the homoepitaxy illustrated by an example of Ag(111).** Rosenfeld, G. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Grenzflaechenforschung und Vakuumphysik; Bonn Univ. (Germany). May 1994. 83p. (In German). Order Number DE95711313. Source: OSTI; NTIS (US Sales Only).

Scattering of thermal energy Helium atoms has been used to study the homoepitaxial growth of Ag(111) and to test possibilities of growth mode manipulation. During conventional growth (i.e., continuous deposition at a constant rate onto a substrate at fixed temperature), Ag(111) grows three-dimensionally rough below the transition temperature to step flow ($\simeq$ 450 K). Down to the lowest temperature studied (100 K), no reentrant layer-by-layer growth is found. This behaviour is attributed to a high activation barrier for downward diffusion of adatoms at island edges, which effectively hinders the interlayer mass transport. It is shown, however, that even for this system two-dimensional layer growth can be achieved by artificially enhancing the island density without decreasing the mobility of adatoms on top of islands. With the help of this "trick", the island size at a given coverage is reduced so that atoms deposited on top of an island visit the island edge more frequently, and the mean time between two deposition events on top of an island is decreased. Both factors lead to an enhanced interlayer mass transport. As the island density can be enhanced by lowering the mobility of adatoms during nucleation, this general method for growth mode manipulation is termed "the concept of two mobilities". This concept is generally formulated and illustrated using rate equations and Monte Carlo simulations. (orig.)

1149 (KCP–613-5435) **Copper metallization of stainless steels: Final report.** Rosenblum, B.Z. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Sep 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95001496. Source: OSTI; NTIS; GPO Dep.

Stainless steel plates were vacuum metallized with pure copper films 0.004 inch thick. Prior to metallization the surfaces were cleaned with EPA-approved detergents. A thin layer of chromium was sputtered for improved adhesion followed by sputtering of the copper. Results showed excellent adhesion of the sputtered films to the substrates.

1150 (KFK–4729) **Chemical interactions between as-received and pre-oxidized Zircaloy-4 and Inconel-718 at high temperatures.** Hofmann, P. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)); Markiewicz, M. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung. Jun 1994. 52p. Order Number DE95715571. Source: OSTI; NTIS (US Sales Only); INIS.

Isothermal reaction experiments were performed in the temperature range of 1000 - 1300 C in order to determine the chemical interactions between Zircaloy-4 fuel rod cladding and Inconel-718 spacer grids of Pressurized Water Reactors (PWR) under severe accident conditions. It was not possible to apply even higher temperatures since fast and complete liquefaction of the components occurred as a result of eutectic interactions during heatup. The liquid reaction products formed enhance and accelerate the degradation of the material couples and the fuel elements, respectively. Only small amounts of Inconel are necessary to liquefy large amounts of Zircaloy. Thin oxide layers on the Zircaloy surface delay the beginning of the chemical interactions with Inconel but cannot prevent them. In this work the reaction kinetics have been determined for the system: as-received and pre-oxidized Zircaloy-4/Inconel 718. The interactions can be described by parabolic rate laws; the Arrhenius equations for the various interactions are given. (orig.)

1151 (KFK–5106) **Chemical interactions between as-received and pre-oxidized Zircaloy-4 and stainless steel at high temperatures.** Hofmann, P. (Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung); Markiewicz, M. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung. May 1994. 80p. Order Number DE95715572. Source: OSTI; NTIS (US Sales Only); INIS.

The chemical reaction behavior between Zircaloy-4 and 1.4919 (AISI 316) stainless steel, which are used in absorber assemblies of Pressurized Water Reactors (PWR) and Boiling Water Reactors (BWR), has been studied in the temperature range 1000 - 1400 C. Zircaloy was used in the as-received, pre-oxidized and oxygen-containing condition. The maximum temperature was limited by the fast and complete liquefaction of the reaction couple as a result of eutectic chemical interactions. Liquefaction of the components occurs below their melting point. The effect of oxygen dissolved in Zircaloy plays an important role in the interaction; oxide layers on the Zircaloy surface delay the chemical interactions with stainless steel but cannot prevent them. Oxygen dissolved in Zircaloy reduces the reaction rates and shift the liquefaction temperature to slightly higher levels. The interaction experiments at the examined temperatures with or without pre-oxidized Zircaloy can be described by parabolic rate laws. The Arrhenius equations for the various conditions of interactions are given. (orig.)

1152 (KFK–5361) **An austenitic steel for fuel cladding tubes and core components of LMFBR's with high ductility after neutron irradiation.** Schaefer, L.; Kempe, H. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung; Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung. Jun 1994. 49p. (In German). Order Number DE95715501. Source: OSTI; NTIS (US Sales Only); INIS.

Two heats of an austenitic stainless steel with different priority concerning the resistance against Helium-embrittlement (B801) and

void-swelling (F218) had been developed and tested as a material for fuel rod claddings and core components of liquid metal fast breeder reactors. The two steels show a ductility five times higher than the reference steel 1.4970 in tensile - and creep-rupture-tests after irradiation in reactors with fast and mixed neutron flux respectively. Just so the swelling resistance had been confirmed up to 40 dpa. Checked claddings of the heat F218 in the dimensions 6x0.38 mm, 6.55x0.45 mm and 7.6x0.5 mm are available for pin- and bundle irradiation experiments. (orig.)

1153 (KFK–5369) **Electrochemical corrosion studies on a selected carbon steel for application in nuclear waste disposal containers: Influence of radiolytic products on corrosion in brines.** Farvaque-Bera, A.M.; Smailos, E. Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Nukleare Entsorgungstechnik. Jul 1994. 27p. Order Number DE95715587. Source: OSTI; NTIS (US Sales Only); INIS.

In previous corrosion studies, carbon steels were identified as promising materials for long-lived high-level waste containers that could act as a radionuclide barrier in a rock-salt repository. In this work, effects of some important oxidizing radiolytic products generated in gamma irradiated brines on electrochemical corrosion behaviour of fine-grained steel TStE 355 was studied. The steel was examined by potentiodynamic and potentiostatic polarization at 90 C in a disposal-relevant NaCl-rich brine containing radiolytic products such as H_2O_2, ClO^-, ClO_3^- and ClO_4^- at concentrations between 10^{-4} and 10^{-2} M/l. Polarization curves indicate that in all brines with and without radiolytic products, the steel exhibits active corrosion. Non-uniform general corrosion was observed with no sign of pitting corrosion. ClO_3^- and ClO_4^- additions of 10^{-4}-10^{-3} M/l to the brine do not increase significantly the initial corrosion rate. However, additions of ClO^- and H_2O_2 to the brine change the cathodic process from activation polarization to diffusion polarization and strongly enhance the corrosion rate of the steel beyond the value of the pure brine. At concentrations of 10^{-3}-10^{-2} M/l ClO^- and H_2O_2 in the brine, the initial corrosion rates are higher by a factor of about 11-100 than in the pure brine. Nevertheless, at the lower concentration of 10^{-4} M/l, the increase in rate is higher by a factor of 2-10 only compared to the value in the pure brine. In general, it can be stated that the significance of the radiolytic products to steel corrosion depends on their concentration at the metal-brine interface, which in turn, depends on many factors such as dose rate, amount of water present in the disposal area, escape of gases (e.g. H_2) etc.

1154 (LA–12836-MS) **On the Taylor test, Part 3: A continuum mechanics code analysis of steady plastic wave propagation.** Maudlin, P.J. (Los Alamos National Lab., NM (United States)); Foster, J.C. Jr.; Jones, S.E. Los Alamos National Lab., NM (United States). Nov 1994. 42p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Contract F08630-93-K-0011. Order Number DE95002252. Source: OSTI; NTIS; GPO Dep.

Simple conservation relationships ("Jump" conditions) in conjunction with postulated material constitutive behavior are applied to steady plastic strain waves propagating in problems of uniaxial stress and Taylor Cylinder Impact. These problems are simulated with a two-dimensional Lagrangian continuum mechanics code for numerically validating the Jump relationships as an accurate analytical representation of plastic wave propagation. The constitutive behavior used in this effort assumes isotropy and models the thermodynamic response with a Mie-Grunisen Equation-of-State and the mechanical response with the rate-dependent Johnson-Cook and MTS flow stress models. The Jump relationships successfully replicate the results produced by continuum code simulations of plastic wave propagation and provide a methodology for constructing mechanical constitutive models from experimental plastic wave speed information. Comparisons are also presented between experimental speeds from Taylor Cylinder Impact tests with Jump relationships and continuum code predictions, indicating that the above mentioned flow stress models may not accurately capture plastic wave propagation speeds in annealed and hardened copper.

1155 (LA-UR–94-2845) **Directed light fabrication.** Lewis, G.K.; Nemec, R.; Milewski, J.; Thoma, D.J.; Cremers, D.; Barbe, M. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410189–2: Applications of lasers and electro-optics, Orlando, FL (United States), 17-20 Oct 1994). Order Number DE94018293. Source: OSTI; NTIS; GPO Dep.

Directed Light Fabrication (DLF) is a rapid prototyping process being developed at Los Alamos National Laboratory to fabricate metal components. This is done by fusing gas delivered metal powder particles in the focal zone of a laser beam that is, programmed to move along or across the part cross section. Fully dense metal is built up a layer at a time to form the desired part represented by a 3 dimensional solid model from CAD software. Machine "tool paths" are created from the solid model that command the movement and processing parameters specific to the DLF process so that the part can be built one layer at a time. The result is a fully dense, near net shape metal part that solidifies under rapid solidification conditions.

1156 (LA-UR–94-3284) **Tungsten-uranium penetrator target interaction.** Dunn, P.S.; Damkroger, B.K. Los Alamos National Lab., NM (United States); Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ; AC04-94AL85000. (CONF-9410213–1: 1994 international conference on tungsten and refractory metals, McLean, VA (United States), 17-19 Oct 1994). Order Number DE95000847. Source: OSTI; NTIS; GPO Dep.

Several studies performed in recent years have been directed at determining the penetration mechanism of long rod kinetic energy penetrators into Rolled Homogeneous Armor (RHA). Much of the work has centered on comparing U-0.75Ti and Tungsten Heavy Alloys (WHA), with the goal being to relate the superior ballistic performance of the uranium materials to a fundamental difference in penetration mechanisms. This has been found to be true, with the dominant mechanisms being adiabatic shear in U-0.75Ti and bulk deformation in WHA. Recent work has sought to achieve improvements in the ballistic performance of the tungsten materials via both mechanical property improvements and alloy modifications designed to bring about adiabatic shear. As an alternative, the authors propose the consideration of materials which utilize mechanisms other than bulk deformation and adiabatic shear to optimize ballistic performance. This paper will present the postmortem analysis of a uranium-20 vol% tungsten composite penetrator fired into RHA at 0° obliquity. The analysis shows that the penetration mechanism in this material is bulk heating and extensive co-melting of the target and penetrator at the penetration interface. The results of the analysis will then be compared to a similar analysis made of targets into which U-0.75Ti penetrators had been fired.

1157 (LA-UR–94-3499) **Oxidation behavior of aluminum nanopowders.** Aumann, C.E. (Los Alamos National Lab., NM (United States). Chemical Science and Technology Div.); Skofronick, G.L.; Martin, J.A. Los Alamos National Lab., NM (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941001–6: 41. annual American Vacuum Society symposium, Denver, CO (United States), 24-28 Oct 1994). Order Number DE95002721. Source: OSTI; NTIS; GPO Dep.

Rutherford backscattering spectrometry, thermogravimetric analysis, and high-resolution transmission electron microscopy were used to investigate the oxidation behavior of ultrafine grain aluminum powder. Fractional change in mass of Al powder samples were obtained as a function of temperature and exposure time for samples with different particle size distributions. Activation energy for oxidation is found to depend on average Al particle size and to be much smaller than that known for flat Al samples.

1158 (LA-UR–94-3656) **Tribology and surface mechanical properties of excimer laser nitrided titanium.** Jervis, T.R. (Los Alamos National Lab., NM (United States). Materials Science and Technology Div.); Zocco, T.G.; Tesmer, J.R.; Hirvonen, J.P. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored

by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941144–1: Fall meeting of the Materials Research Society, Boston, MA (United States), 28 Nov - 2 dec 1994). Order Number DE95002751. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have nitrided Ti-6Al-4V alloys using excimer laser pulses at 1.2 J-cm^{-2} in high purity N_2 at approximately one atmosphere. Substantial nitrogen and some oxygen incorporation resulted from multiple pulse processing. Formation of a TiN surface film was not observed. They have examined the tribological and mechanical properties of these surfaces using pin-on-disk and nanoindenter techniques respectively. Nitrogen alloying results in reduced friction and torque noise in the pin-on-disk measurements. At higher N concentrations, very little wear is observed, even after the friction behavior suggests surface deterioration. This is consistent with the formation of a transfer film at the sliding interface. Nanoindenter measurements of the surfaces show increasing hardness proportional to nitrogen incorporation. The tribological improvements can therefore be ascribed to a combination of increased surface hardness and tribochemical effects.

1159 (NEDO-P–9324) **Feasibility study of power generation system with shape memory alloys.** New Energy and Industrial Technology Development Organization, Tokyo (Japan). Mar 1994. 69p. (In Japanese). Order Number DE95714802. Source: OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan.

The power generation system to use shape memory alloys which operate at temperatures below 100°C was conceptually designed and studied in feasibility to amplify the utilization of low temperature energy so far not utilized yet. The energy conversion efficiency of shape memory alloy is 0.7 to 9% per strain of 1 to 8%, so that it has a possibility of being utilized as an energy conversion element. The Ni-Ti alloy excels all the other shape memory alloys in shape recovery stability and corrosion resistivity. The heat engines presently proposed are of four types, i.e., offset crank type, differential pulley turbine type, tilting plate type and piston type. If the deformation strain and life of alloy are taken into consideration, the utilization is highly possible for the piston type heat engine. As a power generation system, engineered is the method in which low temperature waste heat is effectively utilized with an introduction of energy accumulation and storage system. Possibly made structurally compact, the energy conversion part with shape memory alloy is costwise so low that its use has a high feasibility. 56 refs., 70 figs., 8 tabs.

1160 (NUREG/CR–5591-Vol.2-No.2) **Heavy-Section Steel Irradiation Program: Volume 2, No. 2: Semiannual progress report, April–September 1991.** Corwin, W.R. (Oak Ridge National Lab., TN (United States)). Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Oct 1994. 33p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–11568-Vol.2-No.2). Source: OSTI; NTIS; INIS.

Goal is to provide a thorough, quantitative assessment of the effects of neutron irradiation on the material behavior, and in particular the fracture toughness properties, of typical pressure vessel stools as they relate to light-water reactor pressure-vessel integrity. Effects of specimen size, material chemistry, product form and microstructure, irradiation fluence, flux, temperature and spectrum, and post-irradiation annealing are being examined on a wide range of fracture properties. The HSSI Program is into 10 tasks: (1) program management, (2) K_{ic} curve shift in high-copper welds, (3) K_{ia} curve shift in high-copper welds, (4) irradiation effects on cladding, (5) K_{ic} and K_{ia} curve shifts in low upper-shelf welds, (6) irradiation effects in a commercial low upper-sheer weld, (7) microstructural analysis of irradiation effects, (8) in-service aged material evaluations, (9) correlation monitor materials, and (10) special technical assistance. This report provides an overview of the activities within each of these tasks from April to September 1991.

1161 (NUREG/CR–6249) **Unirradiated material properties of Midland weld WF-70.** McCabe, D.E. (Oak Ridge National Lab., TN (United States)); Nanstad, R.K.; Iskander, S.K.; Swain, R.L. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering; Oak Ridge National Lab., TN (United States). Oct 1994. 84p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/TM–12777). Source: OSTI; NTIS; INIS; GPO.

Weld metal, designated WF-70, taken from the nozzle course and beltline welds of the Midland Reactor, Unit 1, has been given a preliminary evaluation using the conventional Charpy V-notch (CVN), drop-weight (DWT), and chemical analyses. These tests indicated essentially identical fracture toughness at both locations, but there was a significant deference in copper content, nominally 0.25% versus 0.40%. Because the objective of this study was to evaluate the before-and-after irradiation properties, these are regarded as different materials. This report summarizes material characterization results and presents the results of fracture mechanics tests on the unirradiated material to establish baseline transition temperature and J-R curves. Tensile properties were also determined. Five experimental objectives to be accomplished from the testing of irradiated materials were identified. One of the more important objectives is to improve the precision of transition temperature shift and to identify any curve shape changes after irradiation, concentrating on utilizing data from small surveillance capsule size specimens.

1162 (SAND–94-1539C) **Effect of neutron irradiation on the impact properties of A533B steel.** Schubert, L.E. (Univ. of Missouri, Rolla, MO (United States)); Kumar, A.S.; Rosinski, S.T.; Hamilton, M.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940657–6: 17. symposium on effects of radiation on materials, Sun Valley, ID (United States), 20-23 Jun 1994). Order Number DE95001834. Source: OSTI; NTIS; INIS; GPO Dep.

A new methodology is proposed to correlate the upper shelf energy (USE) of full size and subsize Charpy specimens of a nuclear reactor pressure vessel plate material, ASTM type A 533 Grade B (A533B) having a low USE (USE < 100 J). The methodology appears to be more satisfactory than those methodologies proposed earlier. The USE was normalized by a normalization factor involving the dimensions of the Charpy specimen, the elastic stress concentration factor, and the plastic constraint at the notch root. The normalized values of the USE were found to be invariant with specimen size. In addition, it was also found that the ratio of the USE of unirradiated to that of irradiated materials was approximately the same for full, half, and third size specimens. The ductile-to-brittle transition temperature (DBTT) increased due to irradiation at 150 C to a nominal fluence of 1.0 x 10^{19} n/cm^2 (E > 1 MeV) by 78 °, 83°, and 70°C for full, half, and third size specimens, respectively. These shifts in DBTT appeared to be independent of specimen size and notch geometry.

1163 (SAND–94-1716) **Characterization and electrical properties of copper films grown via direct liquid coinjection of (hfac)Cu(TMVS) and TMVS.** Parmeter, J.E.; Petersn, G.A.; Ablett, C.A.; Smith, P.M. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002957. Source: OSTI; NTIS; GPO Dep.

This report documents the characterization of thin copper films grown at Sandia as part of on-going research in copper CVD involving Sandia and Schumacher, Inc. The films have been grown using the copper (1) CVD precursor (hfac)Cu(TMVS), which was first developed by Schumacher and has been supplied to Sandia by that company. The CVD was performed using a novel technique in which direct liquid coinjection of (hfac)Cu(TMVS) and TMVS (trimethylvinylsilane) into a commercial reactor is utilized. Films were deposited onto silicon nitride substrates at temperatures in the range of 220-250°C, with growth rates in the range of 400-800 Å/min. These films have been analyzed by a variety of techniques, with an emphasis on factors that may influence the resistivity, including thickness, purity, density, grain size, and stress. The authors show that these films have as-deposited resistivities of 1.86 ± 0.1 μΩ-cm, or 1.82 ± 0.1 μΩ-cm after accounting for surface scattering effects. The latter value is only 0.14 μΩ-cm above the value for high purity bulk copper. The authors discuss factors that

may account for this residual resistivity. They also discuss the effects of film surface roughness on film thickness and resistivity measurements, noting some potential problems associated with the commonly used surface profilometry technique. These results help to establish (hfac)Cu(TMVS) as one of the most promising available copper CVD precursors for metallization applications.

1164 (SAND–94-2676C) **Laser materials processing at Sandia National Laboratories.** Jellison, J.L.; Cieslak, M.J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410189–5: Applications of lasers and electro-optics, Orlando, FL (United States), 17-20 Oct 1994). Order Number DE95002183. Source: OSTI; NTIS; GPO Dep.

The interest in laser processing has been driven by Sandia's responsibility to design, prototype, manufacture, and steward high reliability defense hardware for the Department of Energy. The system requirements for the hardware generally necessitate hermetic sealing for ensured long life operation. With the advent of miniaturized electronic devices, traditional welding processes were no longer practical choices because of their limited ability to make very small weld closures without heat damage to the hardware. Gas and solid state lasers offered the opportunity to make hermetic closure welds in small, heat sensitive hardware. In order to consistently produce quality product, the Sandia laser materials processing team performed research aimed at identifying those critical parameters which controlled the laser welding process. This has been directed towards both the development of quantitative engineering data needed in product design and process control, and research to achieve fundamental process understanding. In addition, they have developed novel diagnostic systems to measure these important parameters, pioneered the use of calorimetric techniques to measure energy transfer efficiencies, and correlated the occurrence of welding defects with alloy compositions and type of laser welding process. Today, Sandia's laser materials processing team continues to advance the state of laser processing technology in many areas, including aluminum laser welding, the design of novel optics for specific laser processing needs, laser micromachining of silicon and diamond for microelectronics applications, and fluxless laser soldering. This paper will serve to highlight some examples of where Sandia has made contributions to the field of laser materials processing and will indicate the directions where they expect to focus their future efforts.

1165 (WHC-SD-SNF-ER–004) **Corrosion evaluation of fuel canister crusher rigging.** Graves, C.E. Westinghouse Hanford Co., Richland, WA (United States). 2 Nov 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002962. Source: OSTI; NTIS; INIS; GPO Dep.

A fuel canister crusher with attached rigging is located in the 105 K-East Basin discharge chute. This equipment is slated to be moved as part of seismic mitigation to prevent a major basin leak through a construction joint located in the base of the chute. This corrosion analysis assessed the load-bearing ability of the rigging, which consists of shackles and thimble-spliced wire rope. The K-East Basin demineralized water results in corrosion rates of <2 mil/year (<0.05 mm/year) for carbon, low-alloy carbon, and stainless steels. The galvanized carbon steel shackles (with low-alloy steel anchor pins) have experienced negligible corrosion and are judged to be mechanically unaffected by their water exposure. The carbon steel wire rope and stainless steel thimbles have undergone minimal corrosion. Due to the small amount of corrosion products (as seen from video inspection), the absence of wire breakage, and a Factor of Safety calculation, it is judged that the wire rope and thimbles would withstand the proposed relocation activities.

1166 (Z–332) **Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions.** Nguyen, D.T. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 18p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE95001723. Source: OSTI; NTIS.

Laboratory investigation has been undertaken to determine the electrochemical behavior and corrosion resistance of various construction materials in a simulated hydrolysis environment (5 wt % sulfuric acid) at temperatures ranging from 90 to 220C. Tests were performed in an autoclave-type electrochemical cell. The corrosion behavior of the test materials was determined using computer-controlled DC potentiodynamic polarization. Corrosion rates of the test materials were determined using AC impedance techniques. Among the stainless steels tested, only alloy N08026 (Carpenter 20Mo-6) performed satisfactory up to a temperature of 100C. The alloy passivated spontaneously in the environment and corroded at a rate of less than 2 mpy. None of the stainless steels tested could be used at 120°C or above. A number of nickel-based alloys tested had good corrosion resistance up to 100C, but their corrosion rate exceeded 2 mpy at higher temperatures. Zirconium alloys were satisfactory up to 180C. Only tantalum and a tantalum-niobium alloy were satisfactory up to 220C.

1167 (Z–333) **Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures.** Nguyen, D.T.; Farina, G.E. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 13p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). Order Number DE95001724. Source: OSTI; NTIS.

The development of a concentrated acid hydrolysis process may necessitate the storage, handling, and processing of concentrated solution of sulfuric acid at temperatures in excess of 70°C. Due to the corrosivity of the sulfuric acid at elevated temperatures, a series of corrosion tests was conducted to determine the corrosion performance and behavior of various construction materials using immersion and electrochemical techniques. Test results showed that among the stainless steels tested, only Carpenter 20Mo-6 performed satisfactorily up to 70°C. It passivated spontaneously and corroded at a rate less than 40 μm/yr (1.6 mpy). Among numerous nickel-based alloys tested, only Hastelloy B-2 had excellent corrosion resistance up to 100°C with a corrosion rate less than 50 μ/yr (2 mpy), although the alloy did not passivate. Zirconium alloy Zr 702 provided excellent corrosion resistance to 100°C. The alloy passivated spontaneously, but its passive range decreased, evidently with increase in temperature. Tantalum and KBI-40 provided excellent corrosion protection at all test temperatures. The materials passivated spontaneously with a wide passive range.

3602 Ceramics, Cermets, and Refractories

Refer also to citation(s) 725, 1164, 1482, 1508, 1670, 2333, 2334, 2336, 2337, 2352, 2371, 2372, 2373, 2374, 2375, 2376, 2378, 2382, 2383, 2386, 2387

1168 (ANL/ET/CP–82340) **Reactive nanophase oxide additions to melt-processed high-$T_c$superconductors.** Goretta, K.C. (Argonne National Lab., IL (United States)); Brandel, B.P.; Lanagan, M.T.; Hu, J.; Miller, D.J.; Sengupta, S.; Parker, J.C.; Ali, M.N.; Chen, Nan. Argonne National Lab., IL (United States). Oct 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941013–2: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95001470. Source: OSTI; NTIS; GPO Dep.

Nanophase TiO_2 and Al_2O_3 powders were synthesized by a vapor-phase process and mechanically mixed with stoichiometric $YBa_2Cu_3O_x$ and $TlBa_2Ca_2Cu_3O_x$ powders in 20 mole % concentrations. Pellets produced from powders with and without nanophase oxides were heated in air or O_2 above the peritectic melt temperature and slow-cooled. At 4.2 K, the intragranular critical current density (J_c) increased dramatically with the oxide additions. At 35–50 K, effects of the oxide additions were positive, but less pronounced. At 77 K, the additions decreased J_c, probably because of inducing a depresion of the transition temperature.

1169 (ANL/ET/CP–83313) **A mechanistic model for radiation-induced crystallization and amorphization in U_3Si.** Rest, J. Argonne National Lab., IL (United States). Jun 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940657–2: 17. symposium on effects of radiation on materials, Sun Valley, ID (United States), 20-23 Jun 1994). Order Number DE94015028. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation-induced amorphization is assessed. A rate-theory model is formulated wherein amorphous clusters are formed by the damage event These clusters are considered centers of expansion (CE), or excess-free-volume zones. Simultaneously, centers of compression (CC) are created in the material. The CCs are local regions of increased density that travel through the material as an elastic (e.g., acoustic) shock wave. The CEs can be annihilated upon contact with CCs (annihilation probability depends on height of the energy barrier), forming either a crystallized region indistinguishable from the host material, or a region with a slight disorientation (recrystallized grain). Recrystallized grains grow by the accumulation of additional CCs. Full amorphization is calculated on the basis of achieving a fuel volume fraction consistent with the close packing of spherical entities. Amorphization of a recrystallized grain is hindered by the grain boundary. Preirradiation of U_3Si above the critical temperature for amorphization results in of nanometer-size grains. Subsequent reirradiation below the critical temperature shows that the material has developed a resistance to radiation-induced amorphization higher dose needed to amorphize the preirradiated samples than now preirradiated samples. In the model, it is assumed that grain boundaries act as effective defect sinks, and that enhanced defect annihilation is responsible for retarding amorphization at low temperature. The calculations have been validated against data from ion-irradiation experiments with U_3Si. To obtain additional validation, the model has also been applied to the ion-induced motion of the interface between crystalline and amorphous phases of U_3Si. Results of this analysis are compared to data and results of calculations for ion bombardment of Si.

1170 (CONF-880118–1) **The nitridation of high purity, laser-synthesized silicon powder to form reaction bonded silicon nitride.** Sheldon, B.W.; Haggerty, J.S. Massachusetts Inst. of Tech., Cambridge, MA (United States). Jan 1988. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER45313. From 12. annual conference on composites and advanced ceramic materials; Cocoa Beach, FL (United States); 20-22 Jan 1988. Order Number DE95001989. Source: OSTI; NTIS; GPO Dep.

The nitriding kinetics of high purity 0.2 μm Si powders made from laser heated SiH_4 gas were studied with thermogravimetric analysis (TGA), X-ray diffraction, scanning electron microscopy (SEM), and transmission electron microscopy (TEM). Compared to conventional reaction bonded Si_3N_4 (RBSN), nitridation occurred more rapidly and at lower temperatures (e.g. > 97% conversion in less than ten minutes at 1250°C). Samples exhibited unusual reverse reaction gradients with more nitridation occurring inside of pellets than at the outer surfaces. Exposure to methanol retarded nitridation.

1171 (CONF-890130–6) **The formation of reaction bonded Si_3N_4 at low temperatures and in short times.** Sheldon, B.W.; Haggerty, J.S. Massachusetts Inst. of Tech., Cambridge, MA (United States). Materials Processing Center. [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER45313. From 13. annual conference on composites and advanced ceramics; Cocoa Beach, FL (United States); 15-18 Jan 1989. Order Number DE95001990. Source: OSTI; NTIS; GPO Dep.

The kinetics and mechanisms of nitriding high purity, SiH_4 derived Si powders were investigated. TGA, X-ray diffraction, FTIR spectroscopy, and TEM techniques were employed. Complete nitridation (>99%) was achieved at 1250°C in less than 10 minutes, and nearly complete nitridation (97%) was achieved at 1100°C in less than 5 hours. The effects of temperature, particle diameter, and surface chemistry were studied and results show that the process is principally controlled by the number of Si_3N_4 nuclei that form. Reduced temperature, increased Si particle diameter, and surface contamination all reduce the conversion rate through direct effects on nucleation.

1172 (CONF-940411–55) **Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics.** Omatete, O.O.; Bleier, A. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Spring meeting of the Materials Research Society; San Francisco, CA (United States); 4-8 Apr 1994. Order Number DE95001351. Source: OSTI; NTIS; GPO Dep.

Gelcasting is a forming process in which a concentrated slurry of ceramic powders suspended in a solution of organic monomers is polymerized to form a green body of the powder held in a polymeric gel. The process is suited to the production of near-net-shape complex parts. The slurry should contain high solids loading (~ 50 vol%) in order to minimize shrinkage and distortion during drying and, thus, to produce a relatively dense green body that facilitates sintering of the green part to full density. To produce complex-shaped bodies, however, the slurry has to be fluid at the high solids loading, to flow, and to fill complex-shaped molds. Consequently, there is the need to study the rheology of the gelcasting slurries of typical ceramic powders in order to understand the factors that govern the flow and pourability of these slurries. The rheology of gelcasting slurries of concentrated (30–60 vol%) alumina, zirconia, silicon nitride, and sialon powders with isoelectric points varying between pH 5 and 9, was studied by measuring the viscosity and yield stress as functions of pH. Typically, the rheology is non-Newtonian. The lowest values of viscosity and yield stress that permit the highest solids loading were obtained at high and low pH values, where the powders are colloidally stable, far from the isoelectric points. This relationship applies whether or not a polymer dispersant is present. The acrylamide monomer which is used in gelcasting slurries, lowers these non-Newtonian properties permitting the preparation of more concentrated slurries. Fluid and pourable gelcasting slurries of each powder had apparent viscosities and yield stresses less than 2.0 Pa·s and 50 Pa, respectively.

1173 (CONF-9405187–3) **Cost-effective ceramics program in the United States.** Schulz, R.B. (USDOE, Washington, DC (United States)); Johnson, D.R. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. international symposium on ceramic materials and components for engines; Shanghai (China); 29 May - 1 jun 1994. Order Number DE95001425. Source: OSTI; NTIS; GPO Dep.

The 5-year Cost-Effective Ceramics for Heat Engines program began in 1993. This effort reflects the realization that the problems with reliability of structural ceramics have been largely overcome, but the high cost of structural ceramics is limited their use in commercial applications. The technical causes of high cost were identified, and a technical plan developed. The work elements in the program include the following: economic cost modeling, ceramic machining, powder synthesis, alternative forming and densification processes, yield improvement, standards development, and low-expansion ceramics.

1174 (CONF-9410165–8) **Neutron diffraction study of the magnetic ordering of $BaCuO_{2+x}$.** Wang, X.L. (Oak Ridge National Lab., TN (United States)); Fernandez-Baca, J.A.; Wang, Z.R.; Vaknin, D.; Johnston, D.C. Oak Ridge National Lab., TN (United States); Iowa State Coll., Ames, IA (United States). Dept. of Physics. 8 Aug 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; W-7405-ENG-82. From Neutron scattering; Sendai (Japan); 11-14 Oct 1994. Order Number DE95001357. Source: OSTI; NTIS; GPO Dep.

Neutron diffraction measurements have revealed that $BaCuO_{2+x}$ orders antiferromagnetically below $T_N = (15.0 \pm 0.5)$ with a magnetic propagating vector $\kappa = [1\ 1\ 1]$. The Cu atoms in the Cu_6 ring clusters, located at the (1/4, 1/4, 1/4) positions, order ferromagnetically within these clusters while the clusters themselves order antiferromagnetically. The ordered magnetic moment of each of these Cu atoms is $(0.89 \pm 0.05)\mu_B$ at T=4.2K. No evidence of long-range magnetic ordering of the Cu atoms in the Cu_{18} clusters, located at the (O, O, O) and (1/2, 1/2, 1/2) positions, was found down to a temperature T=2.5K.

1175 (DOE/ER/45157–T6) **A study of mechanical processing damage in brittle materials: Annual progress report, April 1, 1990–March 31, 1991.** Khuri-Yakub, B.T. Stanford Univ., CA (United States). Edward L. Ginzton Lab. Apr 1991. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-84ER45157. Order Number DE95002125. Source: OSTI; NTIS; GPO Dep.

The authors continued research on the detection and sizing of surface and bulk defects in hot pressed silicon nitride bearing balls. Two methods were used for these studies: (1) continuation of the

application of acoustic microscopy, and (2) a novel technique based on measuring the mechanical quality factor of spherical resonances of the bearing ball.

1176 (DOE/ER/45252–T6) **The mechanical behavior of surface-modified ceramics: Final report, June 1, 1990–May 31, 1994.** Green, D.J. Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering. Sep 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER45252. Order Number DE95001704. Source: OSTI; NTIS; GPO Dep.

The work in the project was focused on: indentation fracture of ion-exchanged glasses, strength variability of residually stressed brittle materials, fracture of SiC-coated graphite, and subcritical crack growth in stress-free and ion-exchanged glasses.

1177 (DOE/PC/94224–T1) **High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994.** Yang, S.; Brown, J.J. Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Dept. of Materials Science and Engineering. 1 Sep 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-94PC94224. Order Number DE95001947. Source: OSTI; NTIS; GPO Dep.

High temperature alkali corrosion has caused premature failure of SiC and Si_3N_4 components used in advanced high temperature coal combustion systems. Objective of this research is to develop and characterize CMZP and Mg-doped Al_2TiO_5 coatings on dense SiC and Si_3N_4 heat exchanger materials and strive to expand the existing knowledge of the mechanism of coal combustion corrosion of SiC and Si_3N_4 in the temperature range 1000 to 1400°C.

1178 (INIS-mf–14386, pp. WP05) **The influence of cationic and anionic surfactants on ball milled barium ferrite.** Chambell, S.J. (Univ. of NSW, Australian Defence Force Academy, Canberra, ACT (Australia). Dept. of Physics); Wu, E.; Kaczmarek, W.A.; Ninham, B.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. BARIUM COMPOUNDS/ferrites; BARIUM COMPOUNDS/fragmentation; FRAGMENTATION/surfactants; ALLOYS; FERRITES; FRAGMENTATION; SURFACTANTS; MILLING; MOESSBAUER EFFECT; PH VALUE; POWDER METALLURGY; STRUCTURAL CHEMICAL ANALYSIS; X-RAY DIFFRACTION

1179 (INIS-mf–14386, pp. WP18) **A shock-Hugoniot for Sm_2 Fe_{17} N_x powder.** Lwin, M.J. (Queensland Univ. of Technology, Brisbane, QLD (Australia)); Killen, P.D.; Page, N.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. COMPACTING/shock waves; SAMARIUM ALLOYS/compacting; SAMARIUM ALLOYS/permanent magnets; COMPACTING; IMPACT SHOCK; IRON NITRIDES; POWDER METALLURGY

1180 (INIS-mf–14386, pp. TP22) **Formation of iron carbide-nitrides by mechnochemical reaction between iron and organic H(CN)- ring compounds.** Onyszkiewicz, I. (Uniwersytet Adama Mickiewicza, Poznan (Poland). Inst. Fizyki); Kaczmarek, W.A.; Calka, A.; Ninham, B.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. CARBON NITRIDES/milling; IRON CARBIDES/nitridation; IRON CARBIDES/pyrazines; ANNEALING; MILLING; NITRIDATION; PYRAZINES; LATTICE PARAMETERS; FRAGMENTATION; PHASE TRANSFORMATIONS; STABILITY; STRUCTURAL CHEMICAL ANALYSIS; THERMAL ANALYSIS; X-RAY DIFFRACTION

1181 (INIS-mf–14386, pp. TP23) **Character of electro-mechanical coupling in ceramic materials near F-AF phase boundary.** Sun, D.Z. (Chinese Academy of Sciences, Shanghai (China). Shanghai Institute of Ceramics); Dong, X.L.; Wang, Y.L.; Lin, S.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. PZT/antiferroelectric materials; PZT/electromechanics; PZT/ferroelectric materials; DOMAIN STRUCTURE; HAFNIUM COMPOUNDS; LANTHANUM COMPOUNDS; PHASE STUDIES; PZT; ELECTROMECHANICS; SINTERING; TEMPERATURE DEPENDENCE

1182 (INIS-mf–14386, pp. TP29) **Low pressure growth of diamond films.** Kostidis, L. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Prawer, S. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. DIAMONDS/nucleation; DIAMONDS/thin films; NUCLEATION/pressure dependence; CHEMICAL VAPOR DEPOSITION; CRYSTAL GROWTH; DIAMONDS; NUCLEATION; LOW PRESSURE; SILICON NITRIDES

1183 (INIS-mf–14386, pp. TP44) **Quench recovery processes associated with defect behaviour in YBCO near the critical temperature.** Sujito (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Anderson, A.R.; Godamanne, G.; Russell, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/quenching; HIGH-TC SUPERCONDUCTORS/ultrasonic testing; QUENCHING/activation energy; BARIUM OXIDES; COPPER OXIDES; CRYSTAL DEFECTS; QUENCHING; INTERNAL FRICTION; KHZ RANGE 01-100; STABILITY; YTTRIUM OXIDES

1184 (INIS-mf–14386, pp. TP62) **A Shock-Hugoniot for YBa_2 Cu_3 O_7 powder.** Fitzsimmons, J.R. (Queensland University of Technology, Brisbane, QLD (Australia)); Killen, P.D.; Page, N.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. SHOCK WAVES/compactification; YTTRIUM OXIDES/compactification; ALUMINIUM; BARIUM OXIDES; COPPER OXIDES; IMPACT SHOCK; POWDER METALLURGY; COMPACTIFICATION; SUPERCONDUCTING COMPOSITES; ULTRASONIC TESTING

1185 (INIS-mf–14386, pp. TP69) **YBCO thin film deposition by cathodic arc and laser ablation.** Jenkins, B. (Sydney Univ., NSW (Australia). School of Physics); McKenzie, D.R.; Foley, C.P.; Sloggett, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. THIN FILMS/plasma arc spraying; YTTRIUM OXIDES/thin films; ABLATION; BARIUM OXIDES; CATHODE SPUTTERING; COPPER OXIDES; HIGH-TC SUPERCONDUCTORS; JOSEPHSON JUNCTIONS; LASER-RADIATION HEATING; SURFACE COATING; TEMPERATURE RANGE 0065-0273 K

1186 (INIS-mf–14386, pp. TP72) **Production of superconducting thick films through cation chelated organic precursors.** Yavuz, M. (The Centre of Superconducting and Electronic Materials, NSW (Australia)); Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting,

Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CHELATES/organic polymers; SUPERCONDUCTING FILMS/chelates; ALCOHOLS; CHELATES; GLYCOLS; HIGH-TC SUPERCONDUCTORS; PRECURSOR; THICKNESS

1187 (INIS-mf–14386, pp. FM01) **In-situ X-ray study of freezing and melting of Bi(2212) and Bi(2223).** Finnemore, D.K. (Iowa State Univ. of Science and Technology, Ames, IA (United States). Dept. of Physics). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/bismuth complexes; HIGH-TC SUPERCONDUCTORS/phase studies; CRYSTAL GROWTH; FREEZING; MELTING; PHASE TRANSFORMATIONS; REAL TIME SYSTEMS; X-RAY RADIOGRAPHY

1188 (INIS-mf–14386, pp. WP07) **Maximum entropy method study of the structure of Mg_2 NI D_4 at 540 K using neutron diffraction data.** Kisi, E.H. (Newcastle Univ., NSW (Australia)). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. MAGNESIUM HYDRIDES/neutron diffraction; MAGNESIUM HYDRIDES/nickel compounds; NEUTRON DIFFRACTION/calculation methods; CRYSTAL MODELS; CRYSTAL STRUCTURE; CRYSTAL-PHASE TRANSFORMATIONS; CUBIC LATTICES; ENTROPY; TEMPERATURE RANGE 0400-1000 K

1189 (INIS-mf–14386, pp. WP50) **Cleavage luminescence in semiconductors.** Li, D.G. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); McAlpine, N.S.; Haneman, D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. SEMICONDUCTOR MATERIALS/cleavage; CRYSTAL DEFECTS; EMISSION SPECTRA; LUMINESCENCE; CLEAVAGE; SURFACE PROPERTIES; WAVELENGTHS

1190 (INIS-mf–14386, pp. TP27) **Micro-Raman studies of wear of MG-PSZ.** Kelly, G.L. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Batchelor, W.J.; Finlayson, T.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. WEAR/raman spectroscopy; ZIRCONIUM OXIDES/magnesium oxides; ZIRCONIUM OXIDES/phase transformations; CERAMICS; GRAIN ORIENTATION; GRAIN SIZE; MONOCLINIC LATTICES; ORTHORHOMBIC LATTICES; RAMAN SPECTRA; WEAR

1191 (INIS-mf–14386, pp. TP32) **Cell parameters and the orthorhombic to cubic transformation in strontium substituted perovskite ($CaTiO_3$).** Ball, C.J. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Advanced Materials Program); Begg, B.D.; Vance, E.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. PEROVSKITE/lattice parameters; PEROVSKITE/strontium additions; CUBIC LATTICES; ORTHORHOMBIC LATTICES; PEROVSKITE; PHASE TRANSFORMATIONS; STRUCTURAL CHEMICAL ANALYSIS

1192 (INIS-mf–14386, pp. TP54) **Microstructure development and phase transformation of Ag-sheathed Bi-2223 tapes.** Liu, H.K. (Wollongong Univ., NSW (Australia)); Dou, S.X.; Collings, E.W.; Sumption, M.D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. BISMUTH OXIDES/microstructure; BISMUTH OXIDES/phase transformations; SUPERCONDUCTING FILMS/bismuth oxides; ANNEALING; MICROSTRUCTURE; CLADDING; CRITICAL CURRENT; CURRENT DENSITY; HEAT TREATMENTS; SCANNING ELECTRON MICROSCOPY; SILVER; TEMPERATURE DEPENDENCE; X-RAY DIFFRACTION

1193 (INIS-mf–14386, pp. TP56) **Microstructural and superconducting properties of Bi(2223)/Ag tapes during heat treatment process.** Guo, Y.C. (Wollongong Univ., NSW (Australia)); Liu, H.K.; Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. BISMUTH OXIDES/microstructure; BISMUTH OXIDES/transition temperature; SUPERCONDUCTING FILMS/silver additions; MICROSTRUCTURE; CALCIUM OXIDES; CLADDING; COPPER OXIDES; ELECTRIC CONDUCTIVITY; HEAT TREATMENTS; LEAD ADDITIONS; SCANNING ELECTRON MICROSCOPY; SINTERING; STRONTIUM OXIDES; STRUCTURAL CHEMICAL ANALYSIS; SUPERCONDUCTIVITY; TEMPERATURE RANGE 0065-0273 K; X-RAY DIFFRACTION

1194 (INIS-mf–14386, pp. TP58) **The defects of high J_c melt textured YBa_2 Cu_3 O_{7-x} superconductors.** Xia, J.A. (New South Wales Univ., Kensington, NSW (Australia). Dept. of Civil Engineering Materials); Munroe, P.R.; Zhao, Y.; Liu, H.K.; Dou, S.X. [1994]. 227p. Sponsored by Department of Industry, Technology and Commerce, Canberra, ACT (Australia);Australian Research Council, Canberra, ACT (Australia). (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/microstructure; SUPERCONDUCTIVITY/crystal defects; BARIUM OXIDES; COPPER OXIDES; CRITICAL CURRENT; CURRENT DENSITY; MICROSTRUCTURE; MAGNETIC FLUX; SCANNING ELECTRON MICROSCOPY; STRUCTURAL CHEMICAL ANALYSIS; SUPERCONDUCTIVITY; TRANSMISSION ELECTRON MICROSCOPY; X-RAY DIFFRACTION; YTTRIUM OXIDES

1195 (INIS-mf–14386, pp. TP59) **Vortex-glass superconductivity in low magnetic field in YBa_2 Cu_3 O_{7-y}/V_2 O_5 composite.** Zhao, Y. (Univ. of New South Wales, Kensington, NSW (Australia). School of Material Science and Engineering); He, Y.Y. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 5 refs. SUPERCONDUCTING COMPOSITES/order-disorder transformations; SUPERCONDUCTING COMPOSITES/vortex flow; BARIUM OXIDES; COPPER OXIDES; ELECTRIC CONDUCTIVITY; MAGNETIC FIELDS; VANADIUM OXIDES; YTTRIUM OXIDES

1196 (INIS-mf–14386, pp. TP60) **Structure and superconductivity in $YBaSrCu_{3-x}$ Sn_x O_y compound.** Zhao, Y. (Univ. of New South Wales, Kensington, NSW (Australia). School of Material Science and Engineering); Xia, J.A.; Gu, G.D.; Russell, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 6 refs. SUPERCONDUCTING COMPOSITES/microstructure; SUPERCONDUCTING COMPOSITES/transition temperature; BARIUM OXIDES; COPPER OXIDES;

HOLE MOBILITY; SINTERING; STRONTIUM OXIDES; STRUCTURAL CHEMICAL ANALYSIS; MICROSTRUCTURE; TIN OXIDES

1197 (INIS-mf–14386, pp. TP12) **Piezoelectric ceramic/polymer composites for dumping of mechanical vibrations.** Luo, H.H. (Monash Univ., Clayton, VIC (Australia). Dept. of Materials Engineering); Rossiter, P.L.; Simon, G.P.; Koss, L.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CERAMICS/damping; CERAMICS/piezoelectricity; DAMPING/mathematical models; CERAMICS; DAMPING; PIEZOELECTRICITY; DEGREES OF FREEDOM; MECHANICAL VIBRATIONS

1198 (INIS-mf–14386, pp. TP20) **Dielectric relaxations in yttria-stabilised zirconia alloys at lower temperatures.** Chen, Y. (Monash Univ., Clayton, VIC (Australia). Dept. of Materials Engineering); Sellar, J.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. ZIRCONIUM OXIDES/dielectric properties; ZIRCONIUM OXIDES/yttrium base alloys; ACTIVATION ENERGY; DOPED MATERIALS; POTENTIAL ENERGY; RELAXATION; STABILIZED SUPERCONDUCTORS; TEMPERATURE DEPENDENCE

1199 (INIS-mf–14386, pp. TP21) **Glassy thermal expansion of cubic stabilised zirconia alloys.** Chen, Y. (Monash Univ., Clayton, VIC (Australia). Dept. of Materials Engineering); Sellar, J.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. THERMAL EXPANSION/temperature dependence; ZIRCONIUM OXIDES/thermal expansion; ZIRCONIUM OXIDES/yttrium base alloys; CONTRACTION; CUBIC LATTICES; MONOCRYSTALS; PHASE TRANSFORMATIONS; TEMPERATURE MEASUREMENT

1200 (INIS-mf–14386, pp. TP36) **Flux jumps in magnetization loops of melt-textured Y-Ba-Cu-O.** Muller, K.H. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Andrikidis, C. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. TYPE-II SUPERCONDUCTORS/critical current; TYPE-II SUPERCONDUCTORS/magnetic flux; BARIUM OXIDES; COPPER OXIDES; CURRENT DENSITY; PERMANENT MAGNETS; SQUID DEVICES; SUPERCONDUCTING COMPOSITES; TEMPERATURE RANGE 0000-0013 K; YTTRIUM OXIDES

1201 (INIS-mf–14386, pp. TP38) **Hall effect in Zn-doped Y-124.** Mawdsley, Anne (New Zealand Inst. for Industrial Research, Lower Hutt (New Zealand)). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. YTTRIUM OXIDES/hall effect; YTTRIUM OXIDES/zinc additions; BARIUM OXIDES; COPPER OXIDES; CRITICAL CURRENT; CRYSTAL DOPING; HIGH-TC SUPERCONDUCTORS; INTERCHANGEABILITY

1202 (INIS-mf–14386, pp. TP49) **Variable range hopping conductivity in $Y_1$23:$Y_2$11 composites close to the percolation limit.** Gamchi, H.S. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Taylor, K.N.R.; Russell, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. YTTRIUM OXIDES/electric conductivity; YTTRIUM OXIDES/superconducting composites; ALGORITHMS; CURRENT DENSITY; SUPERCONDUCTIVITY; TEMPERATURE DEPENDENCE

1203 (INIS-mf–14386, pp. TP51) **The relation between ultrasonic properties and the critical temperature in Fe doped BSCCO.** Godamanne, G. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Anderson, A.R.; Gu, Genda; Russell, G.J.; Koshizuka, N.; Tanaka, S. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. BISMUTH OXIDES/superconducting composites; IRON ADDITIONS/superconducting composites; SUPERCONDUCTING COMPOSITES/critical temperature; SUPERCONDUCTING COMPOSITES/ultrasonic waves; CALCIUM OXIDES; COPPER OXIDES; CRYSTAL DOPING; INTERNAL FRICTION; STRONTIUM OXIDES; SUPERCONDUCTIVITY; TEMPERATURE RANGE 0065-0273 K

1204 (INIS-mf–14386, pp. TP55) **Oxygen annealing of Bi_2 Sr_2 Ca_1 Cu_2 O_{8+x} single crystals.** Ionescu, H.M. (Wollongong Univ., NSW (Australia)); Dou, S.X.; Ramer, R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. BISMUTH OXIDES/oxygen; BISMUTH OXIDES/transition temperature; OXYGEN/stoichiometry; ANNEALING; OXYGEN; CALCIUM OXIDES; COPPER OXIDES; MAGNETIC SUSCEPTIBILITY; MONOCRYSTALS; STOICHIOMETRY; SUPERCONDUCTING COMPOSITES; SUPERCONDUCTIVITY

1205 (INIS-mf–14386, pp. TP65) **The behaviour of oxygen related defects in BSCCO near the critical temperature.** Anderson, A.R. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Godamanne, G.; Gu, G.; Russell, G.J.; Koshizuka, N.; Tanaka, S. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. CRYSTAL DEFECTS/oxygen; CRYSTAL DEFECTS/ultrasonic testing; TYPE-II SUPERCONDUCTORS/bismuth oxides; TYPE-II SUPERCONDUCTORS/crystal defects; CALCIUM OXIDES; COPPER OXIDES; OXYGEN; INTERNAL FRICTION; PHASE TRANSFORMATIONS; QUENCHING; STABILITY; STRONTIUM OXIDES; TEMPERATURE RANGE 0065-0273 K

1206 (INIS-mf–14386, pp. TP66) **The effect of silver on the I-V characteristics of BSCCO silver-sheathed tapes.** Matthews, D.N. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Muller, K.H.; Andrikidis, C.; Liu, H.K.; Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. CURRENT DENSITY/data processing; CURRENT DENSITY/silver additions; TYPE-II SUPERCONDUCTORS/bismuth oxides; TYPE-II SUPERCONDUCTORS/silver additions; CALCIUM OXIDES; CLADDING; COPPER OXIDES; CREEP; CRITICAL CURRENT; MAGNETIC FLUX; SUPERCONDUCTIVITY; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

1207 (INIS-mf–14386, pp. TP71) **Effect of columnar defects on the critical current anisotropy of epitaxial YBa_2 Cu_3**

$O_{7-\delta}$ thin films and $YBa_2Cu_3O_{7-\delta}/PrBa_2Cu_3O_{7-\delta}$ multilayers. Holzapfel, B. (Institute of Metallic Materials, Dresden (Germany)); Schultz, L.; Saemann-Ischenko, G. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CURRENT DENSITY/anisotropy; HEAVY ION REACTIONS/physical radiation effects; SUPERCONDUCTING FILMS/heavy ion reactions; SUPERCONDUCTING FILMS/irradiation; BARIUM OXIDES; COPPER OXIDES; CRYSTAL DEFECTS; ANISOTROPY; LAYERS; LEAD 208 BEAMS; MAGNETIC FLUX; MEV RANGE 100-1000; PRASEODYMIUM OXIDES; IRRADIATION; SUPERCONDUCTIVITY; THIN FILMS; XENON 129 BEAMS

1208 (INIS-mf–14386, pp. TA01) **Long-length high-Tc superconductor processing, properties and applications.** Collings, E.W. (Battelle Columbus Div., OH (United States)). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/bismuth complexes; PHYSICAL PROPERTIES; SUPERCONDUCTING COILS; SUPERCONDUCTING DEVICES; SUPERCONDUCTING MAGNETS; USES

1209 (INIS-mf–14386, pp. WP13) **Hyperfine magnetic fields of rare earths substituted ferrimagnetics.** Ramer, R. (New South Wales Univ., Kensington, NSW (Australia)); Ionescu, M.; Sorrell, C.C.; Barb, M.; Diamandescu, L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. FERRITE GARNETS/magnetic properties; FERRITE GARNETS/rare earth additions; CRYSTAL LATTICES; FERROMAGNETIC MATERIALS; GADOLINIUM COMPOUNDS; HYPERFINE STRUCTURE; MOESSBAUER EFFECT; STRUCTURAL CHEMICAL ANALYSIS; YTTRIUM COMPOUNDS; ZEEMAN EFFECT

1210 (INIS-mf–14386, pp. WP35) **Massively parallel studies of the electronic structure of disordered micro-crystallites of transition metal oxides.** Michalewicz, M.T. (CSIRO, Carlton, VIC (Australia). Div. of Information Technology). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRONIC STRUCTURE/equations of motion; ELECTRONIC STRUCTURE/parallel processing; TITANIUM OXIDES/crystal defects; TITANIUM OXIDES/electronic structure; ELECTRON DENSITY; ORDER-DISORDER TRANSFORMATIONS; SUPERLATTICES; TRANSITION ELEMENTS; VACANCIES

1211 (INIS-mf–14386, pp. TP02) **External control of microwave properties of dielectric materials.** Maddison, D.S. (Materials Research Labs., Maribyrnong, VIC (Australia)); Jewsbury, P.; Amiet, A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. DIELECTRIC MATERIALS/permittivity; PERMITTIVITY/s matrix; PERMITTIVITY; ELECTRIC FIELDS; FLUID MECHANICS; POLARIZATION; PZT; RHEOLOGY; SUPERCONDUCTIVITY

1212 (INIS-mf–14386, pp. TP53) **Spectral cathodoluminescence studies in $YBa_2Cu_3O_{7-x}$ and its related components.** Stockton, G. (University of Technology, Sydney, NSW (Australia)); Phillips, M.R.; Kirkup, L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. SUPERCONDUCTING COMPOSITES/cathodoluminescence; SUPERCONDUCTING COMPOSITES/impurities; BARIUM OXIDES; COPPER OXIDES; HUMIDITY; PHASE STUDIES; RESOLUTION; CATHODOLUMINESCENCE; IMPURITIES; YTTRIUM OXIDES

1213 (INIS-mf–14386, pp. TP73) **Charge compensation mechanisms for aliovalent impurities in perovskite and zirconolite.** Vance, E.R. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Advanced Materials Program); Day, R.A.; Begg, B.D.; Blackford, M.G. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. PEROVSKITE/charge states; PEROVSKITE/rare earth additions; ZIRCONOLITE/charge states; ZIRCONOLITE/rare earth additions; COORDINATION VALENCES; CRYSTAL STRUCTURE; ELECTRIC CHARGES; IMPURITIES; PEROVSKITE; REDOX PROCESS; SOLID SOLUTIONS; STRUCTURAL CHEMICAL ANALYSIS; SYNROC PROCESS; VACANCIES; ZIRCONOLITE

1214 (INIS-mf–14386, pp. WP10) **Mechanochemically induced reduction of zircon sand.** Puclin, T. (Australian National Univ., Canberra, ACT (Australia). Research School of Physical Sciences); Kaczmarek, W.A.; Ninham, B.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. FRAGMENTATION/ion exchange; ZIRCON/reduction; ZIRCONIUM OXIDES/separation processes; ZIRCONIUM OXIDES/structural chemical analysis; ANNEALING; CALCIUM ADDITIONS; MAGNESIUM ADDITIONS; FRAGMENTATION; MILLING; SAND; TEMPERATURE DEPENDENCE; ZIRCON; REDUCTION

1215 (INIS-mf–14386, pp. TP04) **Growth and properties of carbon nitride thin films.** Kumar, S. (Macquarie Univ., North Ryde, NSW (Australia)); Tansley, T.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CARBON NITRIDES/crystal growth; CARBON NITRIDES/structural chemical analysis; BOND LENGTHS; OPTICAL PROPERTIES; PHOTOELECTRON SPECTROSCOPY; RF SYSTEMS; SCANNING ELECTRON MICROSCOPY; THIN FILMS

1216 (INIS-mf–14386, pp. TP08) **Investigation of carbon-nitride depositions produced by high energy density discharge in nitrogen gas atmosphere.** Gurarie, V. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Orlov, A.; Nugent, K.; Peng, J.L.; Prawer, S. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 5 refs. CARBON NITRIDES/structural chemical analysis; CARBON NITRIDES/surface coating; SURFACE COATING/gas discharge tubes; CATHODES; ELECTRON SPECTROSCOPY; HARDNESS; NITROGEN; RUTHERFORD SCATTERING; SCANNING ELECTRON MICROSCOPY; WEAR RESISTANCE

1217 (INIS-mf–14386, pp. TP39) **A study of transition metal implanted single crystal $YBa_2Cu_3O_{7-\delta}$.** Martin, J.W. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Russell, G.J.; Hartmann, A.; Cohen, D.D.; Evans, P.J. [1994]. 227p. Sponsored by Australian Inst. of Nuclear Science

and Engineering, Lucas Heights, NSW (Australia). (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ION IMPLANTATION/transition temperature; SUPERCONDUCTING COMPOSITES/ion implantation; SUPERCONDUCTING COMPOSITES/structural chemical analysis; ANNEALING; BARIUM OXIDES; COPPER OXIDES; CRYSTAL STRUCTURE; IRON IONS; MAGNETIC SUSCEPTIBILITY; MONOCRYSTALS; NICKEL IONS; OXYGEN ENHANCEMENT RATIO; PHOTOELECTRON SPECTROSCOPY; RUTHERFORD SCATTERING; TEMPERATURE RANGE 0065-0273 K; X-RAY DIFFRACTION; YTTRIUM OXIDES

1218 (INIS-mf–14386, pp. TP50) **Superconductivity of Fe-substituted Bi_2 Sr_2 Ca_1 Cu_2 O_x single crystals.** Gu, G.D. (New South Wales Univ., Kensington, NSW (Australia)); Zhao, Y.; Cochrane, J.W.; Anderson, A.R.; Russell, G.; Takamuku, K.; Koahizuka, N. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. BISMUTH OXIDES/iron additions; BISMUTH OXIDES/structural chemical analysis; SUPERCONDUCTING COMPOSITES/transition temperature; CALCIUM OXIDES; COPPER OXIDES; CRITICAL TEMPERATURE; CRYSTAL GROWTH; MAGNETIC SUSCEPTIBILITY; MONOCRYSTALS; STRONTIUM OXIDES; SUPERCONDUCTIVITY

1219 (INIS-mf–14393, pp. 20-21) **Defects in epitaxial GaInP.** Krynicki, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Zaidi, M.A.; Zazoui, M.; Bourgoin, J.C.; Delage, S.L.; Blanc, H. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. DOPED MATERIALS/crystal defects; DOPED MATERIALS/gallium phosphides; EPITAXY; INDIUM IONS; IONIZATION POTENTIAL

1220 (INIS-mf–14393, pp. 85-86) **Process of formation of gels in the systems (Y^{3+}-Ba^{3+}-Cu^{2+}) or (Bi^{3+}-Pb^{2+}-Sr^{2+}-Ca^{2+}-Cu^{2+})-CH_3COO-NH_4OH-H_2O and their transformation to high temperature superconductors (HTS): $YBa_2Cu_3O_{7-x}$ (YBCO) $Bi_2Sr_2Ca_1Cu_2O_{8+\delta}$ (BSCCO 2212), Bi_2Sr_2 $Ca_2Cu_3O_{10+\delta}$ (BSCCO 2223) and $Bi_{1.6}Pb_{0.4}Sr_2$ $Cu_3O_{10+\delta}$ (BSCCO 2223)** Deptula, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Lada, W.; Olczak, T. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs., 3 figs. SUPERCONDUCTORS/phase transformations; SUPERCONDUCTORS/sol-gel process; CERAMICS; INFRARED SPECTRA; SUPERCONDUCTORS; THERMAL GRAVIMETRIC ANALYSIS; X-RAY DIFFRACTION

1221 (INIS-mf–14393, pp. 87-88) **Magnetism of lanthanide intermetallic compounds.** Leciejewicz, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Szytula, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs., 4 figs. RARE EARTH COMPOUNDS/magnetic properties; RARE EARTH COMPOUNDS/neutron diffraction; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K

1222 (INIS-UA–005) **Nuclear-physical researches (Theory and experiments). Scientific-technical collection.** Voprosy atomnoj nauki i tekhniki. Yaderno-fizicheskie issledovaniya (Teoriya i ehksperiment), v. 126. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

The collection contains mainly the research results of high-temperature superconductors (HTSC). The formation processes of HTSC structure under various fabrication procedures were studied. Interconnection between the HTSC structure and properties were set up. Part of the articles deals with study of metals and semiconductors properties.

1223 (INIS-UA–005, pp. 3-14) **Microstructure and superconducting properties of the crystallized yttrium ceramics.** Tikhonovskij, M.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Petrenko, V.T.; Tortika, A.S.; Matsakova, A.A.; Rudycheva, T.Yu.; Martynyuk, L.I.; Verkhorobin, L.F.; Lapina, N.V.; Panov, V.A. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Influence of melt slow cooling regime and directed melt crystallization on microstructure, superconducting and kinetic properties of yttrium ceramics Y Ba_2 Cu_3 $O_{7-\delta}$ was investigated. Influence of rate and direction of crystallization as well as temperature-time regimes during crystallization and following thermal treatment in oxygen flux, preliminary vacuum treatment was studied.

1224 (INIS-UA–005, pp. 15-21) **Superconducting, kinetic and structural properties of the quenched ceramic samples Bi, Pb-Sr-Ca-Cu-O.** Matsakova, A.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Bovda, A.M.; Tikhonovskij, M.A.; Tikhinskij, G.F.; Martynyuk, L.I.; Verkhorobin, L.F.; Yarovoj, V.G.; Kostin, O.A. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Which were quenched in the temperature range 700-845 deg C were measured. Influence of cooling rate after thermal treatment on ceramics properties was investigated.

1225 (INIS-UA–005, pp. 22-24) **Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition.** Dejneka, T.G. (Institut monokristallov AN Ukrainy Khr'kov, (Ukraine)); Kotok, L.A.; Meshkova, O.V.; Poltoratskij, Yu.B.; Teplitskaya, T.S. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Phase formation in the Bi-Pb-Sr-Ca-Cu-O system with nominal compositions 2223,4334 and 4457 was studied. Difference in kinetics of superconducting cell formation and changes in 2212 and 2223 cell parameters depending on nominal composition at the same lead content was observed. It was shown with the help of x-ray photoelectron spectroscopy that with increase of lead content in samples, content of Cu^{+2} as well as radiation stability of surface increase too.

1226 (INIS-UA–005, pp. 25-28) **About influence of silver additions on superconducting properties of the HTSC ceramic.** Tret'yakov, V.M. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Tikhinskij, G.F.; Pugachev, N.S.; Petrenko, V.T.; Yarovoj, V.G. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

An attempt was made to distribute silver homogeneously an the surface of initial powder used for HTSC ceramics preparation. For this purpose silver was added in powders of yttrium and bismuth ceramics with Ag NO_3 solution in water or in alcohol with phenol. A conclusion was made that not only one, but several metals can be added by this method.

1227 (INIS-UA–005, pp. 29-31) **Variation of properties of the HTSC ceramic doped by silver.** Malikov, V.Ya. (Institut monokristallov AN Ukrainy, Khar'kov (Ukraine)); Stadnik, P.E.; Timan, B.L.; Kvichko, L.A.; Kotok, L.A.; Ramakaeva, R.F. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij

Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Variations in time of physical properties of the HTSC ceramics doped by silver were investigated. Non-monotonous dependence of the magnetic susceptibility and critical current on silver concentration was found.

1228 (INIS-UA–005, pp. 32-35) **Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites.** Matsakova, A.A. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Tikhonovskij, M.A.; Petrenko, V.T.; Martynyuk, L.I.; Verkhorobin, L.F.; Rudycheva, T.Yu. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Electrophysical characteristics (superconductivity transition, electrical resistance) of model composites 123:211 and 123:011 were investigated in a wide of their compositions.

1229 (INIS-UA–005, pp. 36-41) **Low temperature micro plasticity of yttrium ceramics in weak magnetic fields.** Okovit, V.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Starodubov, Ya.D.; Chirkina, L.A.; Lavrinenko, S.D. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Amplitude dependence of internal friction and dislocation module in the range 4,2-300 K was studied for yttrium ceramics of different phase composition, density and granule dimension in magnetic field H=235 Oe and at H=). Micro plasticity maxima and module defects were observed. For the first time changes of micro plasticity and dislocation module depending on magnetic field and external variable voltage are considered.

1230 (INIS-UA–005, pp. 42-45) **ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing.** Tortika, A.S. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst.); Petrenko, V.T.; Tikhonovskij, M.A.; Verkhorobin, L.F.; Lapina, N.V.; Martynyuk, L.I.; Matsakova, A.A.; Rudycheva, T.Yu. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

An original method for obtaining yttrium HTSC which combines arc Welding and quenching of Y Ba_2 Cu_3 O_x with subsequent liquid-phase processing was developed. Structure and superconducting properties of samples were studied.

1231 (INIS-UA–005, pp. 51-56) **Thermal processes at compacted composite Y Ba_2 Cu_3 O_δ/Ag cooling by liquid nitrogen.** Rusanov, K.V. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Tyurina, E.G.; Dotsenko, V.I.; Kislyak, I.F.; Shevchenok, A.A. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Samples of Y Ba Cu O/Ag with different content of silver (up to 50% in volume) and porosity (8...10%) were obtained by explosive compacting. Convective heat exchange depending on Ag content was investigated at the nitrogen boiling on composite surface.

1232 (IS-M–803) **Magnetic field dependence of the correlation gap in SmB_6.** Cooley, J.C. (Univ. of Michigan, Ann Arbor, MI (United States)); Aronson, M.C.; Lacerda, A.; Canfield, P.C.; Fisk, Z. Iowa State Univ. of Science and Technology, Ames, IA (United States). 11 Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9408113–5: SCES '94, Amsterdam (Netherlands), Aug 1994). Order Number DE95001684. Source: OSTI; NTIS; INIS; GPO Dep.

We have used magnetoresistance measurements to probe the effect of large magnetic fields on the stability of the electronic gap δ in SmB_6. Although the Zeeman splitting in a 18 Telsa field is comparable to the ambient pressure δ, and even exceeds δ at 56 kbar, δ is in both cases almost completely unaffected by the magnetic field.

1233 (IS-T–1621) **Directional solidification of the alumina-zirconia ceramic eutectic system.** Boldt, C. Iowa State Univ. of Science and Technology, Ames, IA (United States). 27 Jul 1994. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001677. Source: OSTI; NTIS; INIS; GPO Dep.

It is possible to produce alumina-zirconia ceramic samples through existing solidification techniques. The resulting microstructures typically consist of rods of zirconia in an alumina matrix, although a lamellar structure has been noted in some cases. In nearly all cases, colony growth was present which may possibly result from grain size, repeated nucleation events, and lamellar oscillations. In the same vein, it appears that the amount of impurities within the system might be the underlying cause for the colony growth. Colony growth was diminished through impurity control as the higher purity samples exhibited colony free behavior. In addition to colony formations, faceted alumina dendrites or nonfaceted zirconia dendrites may result in the ceramic if the sample is solidified out of the coupled zone. In all cases, for larger-sized Bridgman samples, a lower limit in the eutectic spacing was noted. The solidification model which includes the kinetic effect has been developed, although the effect appears to be negligible under present experimental conditions. A spacing limit might also occur due to the result of heat flow problems. Heat flow out of the ceramic is difficult to control, often causing radial and not axial growth. This behavior is exaggerated in the presence of impurities. Thus, higher purity powders should always be used. Higher purity samples, in addition to yielding a more microstructurally uniform ceramic, also showed increased directionality. In the future, the kinetic model needs to be examined in more detail, and further research needs to be accomplished in the area of molten ceramics. Once better system constants are in place, the kinetic model will give a better indication of the behavior in the alumina-zirconia system.

1234 (ITP–92-17) **Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals.** Kruchinin, S.P.; Yaremko, A.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1992. 28p. Order Number DE95605851. Source: OSTI; NTIS (US Sales Only); INIS.

The HTSC reflection and absorption optic spectra peculiarities are analysed in the paper on the basis of bismuth and thallium. The approach suggested takes into account the complex character of crystals structure, possible localization of excitations in the isolated layers and further excitations exchange due to the interlayer interaction between cuprate (Cu O) and quasi-degenerate bismuth layers (Bi O/3pO). The expressions for the excitation and intensity energies of the corresponding transitions are obtained. It is shown that only part of excitations whose number is determined by the number of layers in the unit cell will be manifest in optical reflection and absorption spectra. The experimental results on spectral dependence of crystal reflection coefficients are analysed.

1235 (ITP–94-1) **Polarization and intensity of d d-transitions in superconducting copper oxides.** Loktev, V.M. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 5p. Order Number DE95605886. Source: OSTI; NTIS (US Sales Only); INIS.

The simple explanation of experimentally observed dipole character and plane polarization of lowest d d-transitions which is based on pd-hybridization effects is proposed.

1236 (Juel–2890) **Fatigue and component-tests on SISIC-tubes.** Hahne, M.; Roedig, M.; Schubert, F.; Nickel, H. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Werkstoffe der Energitechnik; Technische Hochschule Aachen (Germany). Mar

1994. 139p. (In German). Order Number DE95716124. Source: OSTI; NTIS (US Sales Only).

Dissertation submitted by Hahne, M.

This work is concerned with the determination of mechanical properties of SiSiC-components with different shapes and length (400 to 1700 mm). They have been tested under 4-point bending loading at room temperature, wherefore two test facilities had been developed and built. The obtained results lead to the evaluation of a formalism for the transfer of the fracture strength from small specimens to bigger components. A transfer of the fracture strength between SiSiC-components depending on surface crack damage is given. The specimens need the same population of crack starting failures to get good results. This is possible when the specimens and the components have a minimum size like sticks or tubes with a dimension of 23 mm x 17 mm x 400 mm. The SiSiC-components failed due to of pores, Si-inclusions, not completly siliconized areas, during the grinding precracked SiC-particles and defects resulting of sandblasting. The second part of the thesis describes dynamic and cyclodynamic 4-point-bending testresults to prove the influence of cyclic fatigue. On the behalf of those results obtained by room temperature there is no fatigue effects for the design of SiSiC-components. (orig./RHM)

1237 (LA-UR–94-3537) **In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory.** Yu, N. (Los Alamos National Lab., NM (United States). Materials Science and Technology Div.); Nastasi, M.; Tesmer, J.R.; Hollander, M.G.; Evans, C.R.; Maggiore, C.J.; Levine, T.E. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941129–8: Conference on application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95002738. Source: OSTI; NTIS; INIS; GPO Dep.

The capability of in-situ ion beam modification and characterization of materials developed at Los Alamos National Laboratory is described. A beam-line from a 3 MV tandem accelerator and a beam-line from a 200 kV ion implanter are joined together in an in-situ target chamber. The chamber is equipped with a cold and hot sample stage with a temperature range from −100 to 500 C. The angular (sample spin and basal rotation) motions and translational motions of the sample stage are controlled by a multi-axis goniometer. This chamber provides a unique capability to conduct a temperature dependent experiment of ion irradiation and sequential backscattering and channeling analysis. The efficiency and reliability of in-situ ion beam techniques are demonstrated by two examples, irradiation damage in (100) $MgAl_2O_4$ spinel crystals and ion-beam-induced densification of zirconia sol-gel thin films.

1238 (LA-UR–94-3568) **Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace.** Pluym, T.C. (and others); Muenchausen, R.E.; Arendt, P.N. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941013–3: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95002745. Source: OSTI; NTIS; INIS; GPO Dep.

$Tl_2Ba_2CaCu_2O_8$ thin films were prepared for the first time by use of a multiple-zone flow-through thallination process. Thallous oxide was volatilized from condensed thallium oxide in a low temperature source zone and convectively transported to a higher temperature thallination zone in which initially amorphous $Ba_2CaCu_2O_5$ precursor films were located. By careful control of the source temperature, film temperature, flow rate, anneal time, and rates of heat up and cool down, smooth $Tl_2Ba_2CaCu_2O_8$ thin films were prepared on (100) $LaAlO_3$ with the following properties: inductive T_c of 107.6 K and 80% transition width of 1.3 K, transport J_c at 75 K of 1.3×10^5 A/cm^2, and R_s at 10 GHz and 80 K of 1.3 mΩ. The scalability of the process to large area film processing was demonstrated by the preparation of $Tl_2Ba_2CaCu_2O_8$ thin films on $LaAlO_3$ three-inch diameter wafers.

3606 Other Materials

Refer also to citation(s) 217, 331, 682, 686, 688, 689, 1004, 1027, 1063, 1119, 1146, 1164, 1478, 1487, 1498, 1501, 1503, 1621, 1625, 1661, 1688, 2323, 2332, 2340, 2355, 2360, 2387, 2393, 2436

1239 (ANL/IPNS/PP–79589) **Topography of neutron scattering from diblock copolymer film.** Cai, Z. (Argonne National Lab., IL (United States)); Russell, T.P. Argonne National Lab., IL (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001457. Source: OSTI; NTIS; GPO Dep.

The surface structure of a multilayered film of symmetric perdeuterated diblock copolymers of polystyrene and polymethylmethacrylate, denoted P(d-S-b-d-MMA), was investigated by neutron scattering at grazing incidence. The film surfaces were covered by islands or holes of uniform height with a lateral size of several micrometers. With the angle of incidence fixed, the off-specular neutron scattering was measured as function of scattering angle and neutron wavelength. The off-specular scattering intensity shows ridges at constant q_z, the momentum transfer along the surface normal. The scattering arises from the surface domains. It was found that the off-specular ridges developed from minima in the oscillations in the specular profile corresponding to domain height. The characteristic of the off-specular scattering, which is different from that of the off-specular scattering due to the conformal roughness in a multilayered film, is interpreted in terms of the correlations of the surface domains.

1240 (CONF-9408175–1) **Creep behavior in SIC whisker-reinforced alumina composite.** Lin, H.T. (Oak Ridge National Lab., TN (United States). Metals and Ceramics Div.); Becher, P.F. Oak Ridge National Lab., TN (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Engineering Foundation conference on plastic deformation of ceramics; Snowbird, UT (United States); 7-12 Aug 1994. Order Number DE95001071. Source: OSTI; NTIS; GPO Dep.

Grain boundary sliding (often accompanied by cavitation) is a major contributor to compressive and tensile creep deformation in fine-grained aluminas, both with and without whisker-reinforcement. Studies indicate that the creep response of alumina composites reinforced with SiC whiskers can be tailored by controlling the composite microstructure and composition. The addition of SiC whiskers (< 30 vol%) significantly increases the creep resistance of fine-grained (1–2 μm) alumina in air at temperatures of 1,200 and 1,300 C. However, at higher whisker contents (30 and 50 vol%), the creep resistance is degraded due to enhanced surface oxidation reactions accompanied by extensive creep cavitation. Densification aids (i.e., Y_2O_3), which facilitate silica glass formation and thus liquid phase densification of the composites, can also result in degradation of creep resistance. On the other hand, increasing the matrix grain size or decreasing the whisker aspect ratio (increased whisker number density) results in raising the creep resistance of the composites. These observations not only explain the variability in the creep response of various SiC whisker-reinforced alumina composites but also indicate factors that can be used to enhance the elevated temperature performance.

1241 (DOE/CE/15520–T13) **Carbon fiber reinforced superconductor composites: Final report, August 8, 1991–August 7, 1994.** Shi, Zheng-Qiang; Chung, D.D.L. State Univ. of New York, Buffalo, NY (United States). 7 Nov 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-91CE15520. Order Number DE95002504. Source: OSTI; NTIS; GPO Dep.

The sandwiching of $YBa_2Cu_3O_{7-\delta}$ by two layers of continuous copper-coated carbon fiber Sn-Pb matrix composite was found to (i) increase the tensile and compressive strengths in the direction parallel to the fibers, such that both strengths increased with increasing fiber volume fraction, (ii) increase the resistance to thermal cycling between room temperature and 77 K, and (iii) increase the stability in air. The sandwich composites were made by diffusion bonding at 110°C and 0.34 MPa, or by hot roll bonding at 240°C and 7.0 cm/s.

1242 (DOE/CE/15613–T2) **Wear resistant composite structure of vitreous carbon containing convoluted fibers: Quarterly report number 2.** Burton Technologies, Inc., Raleigh, NC (United States). 1 Nov 1994. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-94CE15613 ; AC02-88CE90027. Order Number DE95002254. Source: OSTI; NTIS; GPO Dep.

The program goals for the first quarter were to located and contact potential manufacturers of these components, evaluate their level of interest, and begin discussions of the type and design of the prototypes to be fabricated for their evaluation. Thoughtful discussion at this stage would result in fabricating prototypes which answer the greatest number of questions possible for a given manufacturer at the lowest cost to this program. In the present economy many manufacturing firms have almost no funds for testing and evaluating new materials. This places a greater burden on the data obtained from outside laboratories. In many cases this data will be used to make that first evaluation on MRCC's (metal reinforced carbon composites) suitability for a given application and give firms the confidence to commit to a evaluation program. In Exhibit 1, which is attached to this report the authors have the first set of data from outside laboratories. This has been incorporated into a paper which has been accepted for the annual STLE (Society of Tribologist and Lubrication Engineers) conference in Chicago in the spring of 1995. The authors are in active contact with over 20 companies. Some of these have advanced to the point of requesting prototypes and the drawings have been submitted. In addition two groupings of companies have been formed to pool their resources in combined evaluation programs. These are described. The authors are in the process of manufacturing the first prototypes.

1243 (DOE/CE/23810–39) **Thermophysical properties of HFC-143a and HFC-152a: Final report, April 1, 1993–June 30, 1994.** Haynes, W.M. (National Institute of Standards and Technology, Boulder, CO (United States). Thermophysics Division). Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States). Jul 1994. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91CE23810. Order Number DE95002199. Source: OSTI; NTIS; GPO Dep.

Numerous fluids have been identified as promising alternative refrigerants, but much of the information needed to predict their behavior as pure fluids and as components in mixtures does not exist. In particular, reliable thermophysical properties data and models are needed to predict the performance of the new refrigerants in heating and cooling equipment and to design and optimize equipment to be reliable and energy efficient. The objective of this fifteen-month project has been to provide highly accurate, selected thermophysical properties data for refrigerants HFC-143a (CH_3CF_3) and HFC-152a (CH_3CHF_2) and to use these data to fit complex equations of state and detailed transport property models. The new data have filled gaps in the existing data sets and resolved problems and uncertainties that existed in and between the data sets.

1244 (DOE/ER/45085–T2) **Application of quaternary phase diagrams to compound semiconductor processing.** Sinclair, R. Stanford Univ., CA (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-84ER45085. Order Number DE95001813. Source: OSTI; NTIS; GPO Dep.

Isobaric, isothermal phase diagrams are a molar representation of condensed phases in equilibrium with each other at a fixed temperature, pressure, and composition. Since three or four elements are usually involved at a fabricated interface in a semiconductor device, knowledge of the appropriate ternary or quaternary phase diagram is important for optimizing the processing parameters and designing long term stability of devices. While the use of phase diagrams is well-established in the fields of metallurgy, ceramics and mineralogy, only recently have phase diagrams been employed to provide a framework for understanding thin film reactions on a substrate, encountered in semiconductor processing. Even though there are many examples of applications of ternary phase diagrams in the semiconductor literature (for instance, metallization of GaAs, the use of refractory metal silicides for metallization layers in VLSI devices and oxidation of III-V compounds), the same is not true for quaternary phase diagrams. To date, the only application is oxidation of mercury cadmium telluride. This lack of examples is not warranted, as four elements are often involved at a critical interface in compound semiconductor processing and devices. This paper reports on the progress made to remedy this situation by considering the application of quaternary phase diagrams to understanding and predicting the behavior of II-VI thin film interfaces in photovoltaic devices under annealing conditions. Moreover, for the first time, solid solubility is taken into account for quaternary phase diagrams of semiconductor systems.

1245 (DOE/ER/45283–8) **X-ray studies of microstructures in semiconductor and superconducting materials: Progress report.** Kao, Y.H. State Univ. of New York, Buffalo, NY (United States). Dept. of Physics. May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER45283. Order Number DE95001802. Source: OSTI; NTIS; GPO Dep.

The author uses various techniques of X-ray spectroscopy to study semiconductor and superconductor materials. The microstructure of $Si_{1-x}Ge_x$ and Ge layers on silicon are reported. The superlattice structure of indium/gallium arsenides and local structure of manganese doped zinc sulfides as well as indium manganese arsenic compounds were investigated. Epilayer growth was studied for germanium on $silicon_{1-x}Ge_x$.

1246 (DOE/ER/45330–T1) **Excitons in semiconducting superlattices, quantum wells, and ternary alloys: Performance report, September 15, 1987–January 31, 1994.** Sturge, M.D. (Dartmouth Coll., Hanover, NH (United States)); Nahory, R.E.; Tamargo, M.C. Dartmouth Coll., Hanover, NH (United States). Feb 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER45330. Order Number DE95001867. Source: OSTI; NTIS; GPO Dep.

Semiconducting layered structures can be fabricated with precisely defined layer thicknesses down to one monolayer; an example is superlattices (SLs), in which two semiconductors with different band gaps are interleaved. Research aims to understand optically excited states in SLs, particularly Type II indirect SLs (in which the excited electron and hole are separated both in real and in momentum space); time resolved tunable laser spectroscopy is used. Optical experiments were made in SLs with only a few atomic layers per period, to probe the interface quality. From the study of the exciton spectra of the mixed Type I-Type II CdTe/CdZnTe SLs, the band offset at the CdTe/CdZnTe interface was obtained to high accuracy. Analysis of exciton-phonon coupling at isoelectronic traps, which provide a 3-D analog of the exciton traps formed by well width fluctuations in SLs, has corrected errors and given a self-consistent model of phonon-assisted transitions at these centers.

1247 (DOE/ER/45434–4) **Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994.** Barnett, S.A.; Sproul, W.D.; Wong, M.S. Northwestern Univ., Evanston, IL (United States). Oct 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER45434. Order Number DE95002945. Source: OSTI; NTIS; GPO Dep.

The major effort during this report period was to elucidate the hardening mechanisms in polycrystalline superlattices. Since the last progress report, the authors have been working on theoretical modeling of hardening mechanisms in superlattices and have carried out detailed studies of two new polycrystalline superlattice coatings, NbN/VN and CrN/TiN, which were produced using an opposed, dual-cathode, high-rate, reactive, unbalanced-magnetron sputtering system. Significant hardness enhancement the above rule-of-mixture hardness value was found for the CrN/TiN, but not for the NbN/VN. Correlating these results with prior results for TiN/NbN and TiN/VN shows that the major hardening mechanism in polycrystalline superlattices is the difference in layer elastic moduli, which is minimal in the NbN/VN case. The modulus difference provides a barrier to dislocation flow across the layers. In the absence of modulus-difference hardening in NbN/VN, it was found that other hardening mechanisms such as coherency strains and the small grain sizes observed in the superlattices play a minor role. The results achieved in this report period are described in this paper along with publications and presentations.

1248 (INIS-JP–018, pp. 809-816) **Experimental studies on long-term thermal degradation of enclosed neutron shielding resin.** Asano, Ryoji (Hitachi Zosen Corp., Osaka (Japan)); Niomura, Nagao. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

The present works are concerned with the thermal degradation or loss of weight of the mixtures contained in vessels. The resins used is an epoxis, 'NS-4-FR' and the fire resisting material mixed is aluminum hydroxide. Firstly, the effect of temperature on degradation was surveyed on the NS-4-FR by continuous heating tests at different temperatures under unenclosed, or open conditions; 125degC, 150degC, 175degC and 200degC. Then, the effect of difference and shape of materials was surveyed at 150degC. Secondly, continuous heating tests were conducted under open and enclosed conditions at 125degC, 150degC and 175degC and the effect of enclosing the mixtures was obtained. Finally, continuous and cyclic heating tests were conducted under enclosed conditions at 125degC, 150degC and 175degC, which was followed by long-term cyclic heating tests at 150degC for more than one year. As the results, following emperical equation was obtained for the thermal degradation at 150degC of the NS-4-FR: W = 0.55 logD - 0.41 where, W: thermal degradation (weight loss), %, D: heating period, day. From this equation, weight loss in 20 years is obtained as less than 2% which is insignificantly small for shielding effect. (J.P.N.).

1249 (INIS-JP–018, pp. 817-827) **Development of highly effective neutron shields and neutron absorbing materials.** Tsuda, K. (Kobe Steel Ltd. (Japan)); Matsuda, F.; Taniuchi, H.; Yuhara, T.; Iida, T. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

A wide range of materials, including polymers and hydrogen-occluded alloys that might be usable as the neutron shielding material were examined. And a wide range of materials, including aluminum alloys that might be usable as the neutron-absorbing material were examined. After screening, the candidate material was determined on the basis of evaluation regarding its adaptabilities as a high-performance neutron-shielding and neutron-absorbing material. This candidate material was manufactured for trial, after which material properties tests, neutron-shielding tests and neutron-absorbing tests were carried out on it. The specifications of this material were thus determined. This research has resulted in materials of good performance; a neutron-shielding material based on ethylene propylene rubber and titanium hydride, and a neutron-absorbing material based on aluminum and titanium hydride. (author).

1250 (INIS-JP–018, pp. 953-960) **Impact characteristics of energy absorbing materials for radioactive material transport packages.** Chen, T.F. (Lawrence Livermore National Lab., CA (United States)); Fischer, L.E.; VanSant, J.H. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

A series of high-velocity impact tests using grout as the package energy-absorbing material was successfully carried out. The purpose of these tests was to characterize the dynamic behavior of grout material when used as an energy-absorbing material for packages. These package-impact tests were simulated accurately with the dynamic finite element code DYNA, using appropriate grout material properties. The need to invoke the grout damage curve illustrates the fact that the grout mix under study undergoes a transition where the grout retains its full strength at relatively low impact velocity to a diminished strength where progressive debonding and pulverization takes place as the impact velocity increases. The transitional velocity range is a function of a particular grout mix as well as impact conditions. Laboratory tests of the grout mix that include the failure region and different failure modes should be an integral part of the investigation process to accurately correlate package benchmark tests with analytical models. (J.P.N.).

1251 (INIS-mf–14340, pp. 95-116) **Property improvement by gamma polymerization of methyl methacrylate impregnated local Thai wood Yang (Dipterocarpus Sp.).** Saisomboon, S. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Sumitra, T. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Property improvement of a local Thai wood (Yang-Dipterocarpus Sp.) was studied by impregnating with methyl methacrylate before polymerizing with gamma ray. The polymer loading were 126 and 68 percent for sapwood and heart wood, respectively. Significant improvements in impact, compressive and bending strength were observed in the wood polymer composite (WPC). In addition, the microstructure and the impact fractured-surfaces of WPC were also carried with a scanning electron-microscope.

1252 (INIS-mf–14386, pp. TA02) **Growth and surface microstructure of epitaxial $YBa_2Cu_3O_{7-x}$ thin films.** Nick Savvides (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Katsaros, A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. SUPERCONDUCTING COMPOSITES/crystal growth; SUPERCONDUCTING COMPOSITES/microstructure; BARIUM OXIDES; COPPER OXIDES; CRYSTAL LATTICES; ELECTRON MICROSCOPY; EPITAXY; MAGNESIUM OXIDES; MICROSTRUCTURE; THIN FILMS; YTTRIUM OXIDES

1253 (INIS-mf–14386, pp. WP03) **Electron spin resonance and intrinsic stress measurements on diamond synthesized by plasma assisted chemical vapour deposition.** Khachan, J. (Sydney Univ., NSW (Australia). School of Physics); Lukins, P.B.; McKenzie, D.R.; Pigott, J.R.; Falconer, I.S.; James, B.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. DIAMONDS/crystal defects; DIAMONDS/electron spin resonance; THIN FILMS/diamonds; ARGON; CHEMICAL VAPOR DEPOSITION; DIAMONDS; DOPED MATERIALS; MICROWAVE RADIATION; PLASMA; STRESSES

1254 (INIS-mf–14386, pp. TP11) **Preparation and characterisation of certain conducting polymer thin film devices.** Pillai, S.M. (University of Technology, Sydney, NSW (Australia)); Conn, C.; Unsworth, J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. POLYMERS/thin films; THIN FILMS/electrical properties; THIN FILMS/optical properties; CAMPHOR; DOPED MATERIALS; GLASS; POLYMERS; SULFONIC ACIDS; SURFACE COATING

1255 (INIS-mf–14386, pp. TP13) **(e, 2e) measurements of thin graphite film.** Vos, M. (Flinders Univ. of South Australia, Adelaide, SA (Australia). Electronic Structure of Materials Centre); Canney, S.; Storer, P.; Weigold, E. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga

(Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRON DENSITY/electron reactions; GRAPHITE/auger electron spectroscopy; GRAPHITE/electron density; GRAPHITE/thin films; ANNEALING; ELECTRON-ATOM COLLISIONS; ENERGY SPECTRA; ETCHING; GRAPHITE; OXYGEN; PLASMA; STRUCTURAL CHEMICAL ANALYSIS

1256 (INIS-mf–14386, pp. TP14) **Fabrication and characterisation of thin film tetrahedral amorphous carbon.** Gerstner, E.G. (Sydney Univ., NSW (Australia). School of Physics); McKenzie, D.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. CARBON/thin films; THIN FILMS/electrical properties; THIN FILMS/phase transformations; AMORPHOUS STATE; CARBON; CHEMICAL BONDS; DOPED MATERIALS; NITROGEN; PHOTOCONDUCTIVITY; SEMICONDUCTOR MATERIALS; STRUCTURAL CHEMICAL ANALYSIS

1257 (INIS-mf–14386, pp. TP19) **Orientation and polarization effects in the Raman spectroscopy of (110) diamond faces in CVD deposited diamond films.** Weiser, P.S. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Prawer, S.; Nugent, K.W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. DIAMONDS/polarization; DIAMONDS/thin films; POLARIZATION/raman spectroscopy; BACKSCATTERING; CHEMICAL VAPOR DEPOSITION; DIAMONDS; POLARIZATION; INCIDENCE ANGLE; SILICON; SPIN ORIENTATION

1258 (INIS-mf–14386, pp. TP26) **Cure monitoring with fibre optic sensors.** Tapanes, E. (Monash Univ., Clayton, VIC (Australia)); Goode, J.; Hill, A.; Rossiter, P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CURING/epoxides; CURING/optical fibers; OPTICAL FIBERS/decladding; OPTICAL FIBERS/physical radiation effects; OPTICAL FIBERS/silicon oxides; ABSORPTION SPECTROSCOPY; CLADDING; CURING; EPOXIDES; FOURIER TRANSFORMATION; INFRARED RADIATION; DECLADDING; RESINS; SENSITIVITY; WAVE PROPAGATION

1259 (INIS-mf–14386, pp. WA02) **Electronic structure of graphite, diamond-like and graphitic amorphous carbon.** Storer, P. (Flinders Univ. of South Australia, Adelaide, SA (Australia). Electronic Structure of Materials Centre); Canney, S.; Caprari, R.; Vos, Maarten; Weigold, E. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 7 refs. CARBON/electronic structure; ELECTRONIC STRUCTURE/coincidence spectrometry; AMORPHOUS STATE; CARBON; ELECTRON SPECTROSCOPY; GRAPHITE; RESOLUTION; THIN FILMS

1260 (INIS-mf–14386, pp. TA03) **The decoupling between the superconducting layers in $Bi_2Sr_2CaCu_2O_8$/$Bi_2Sr_2Ca_2Cu_3O_10$ intergrowth single crystals.** Zhao, Y. (Univ. of New South Wales, Kensington, NSW (Australia). School of Materials Sciences); Gu, G.D.; Russell, G.J.; Nakamura, N.; Tajima, S.; Uehara, K.; Koshizuka, N. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. SUPERCONDUCTING COMPOSITES/electric conductivity; SUPERCONDUCTING COMPOSITES/josephson effect; BISMUTH OXIDES; CALCIUM OXIDES; COPPER OXIDES; CRYSTAL GROWTH; CRYSTAL MODELS; LAYERS; STRONTIUM OXIDES; TEMPERATURE DEPENDENCE

1261 (INIS-mf–14386, pp. FM07) **Electron energy-loss spectroscopy study of thermal annealing of amorphous hydrogenated carbon.** Yin, Y. (Sydney Univ., NSW (Australia). School of Physics); McKenzie, D.R.; Collins, R.E. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. CARBON/hyperfine structure; HYPERFINE STRUCTURE/energy-loss spectroscopy; AMORPHOUS STATE; ANNEALING; CARBON; ELECTRON SPECTROSCOPY; HYDROGENATION; PLASMONS; TEMPERATURE DEPENDENCE; THIN FILMS

1262 (INIS-mf–14386, pp. FM02) **Magnetic properties of Y 124 and Bi 2212 superconductors.** Koshizuka, Naoki (ISTEC, Tokyo (Japan). Superconductivity Research Laboratory). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 5 refs. HIGH-TC SUPERCONDUCTORS/magnetic properties; ANTIFERROMAGNETISM; BISMUTH COMPLEXES; COPPER OXIDES; CRYSTAL STRUCTURE; DOPED MATERIALS; SMALL ANGLE SCATTERING; SPIN-LATTICE RELAXATION; TEMPERATURE DEPENDENCE; VORTEX FLOW; YTTRIUM COMPLEXES

1263 (INIS-mf–14386, pp. FM04) **Structural and electronic properties of C_60H_36.** Hall, L.E. (Sydney Univ., NSW (Australia)); McKenzie, D.R.; Cockayne, D.J.H.; Vassallo, A.M.; Davis, R.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. FULLERENES/electronic structure; CRYSTAL MODELS; DEUTERIUM; ELECTRICAL PROPERTIES; FOURIER TRANSFORMATION; FULLERENES; HYDROGEN; HYDROGENATION; NEUTRON DIFFRACTION

1264 (INIS-mf–14386, pp. FM06) **Zeeman spectroscopy of indium acceptor impurity in silicon.** Piao, G. (Wollongong Univ., NSW (Australia). Dept. of Physics); Lewis, R.A.; Fisher, P. Australian Research Council, Canberra, ACT (Australia). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 5 refs. SILICON/indium additions; SILICON/zeeman effect; ELECTRICAL PROPERTIES; FANO FACTOR; GYROMAGNETIC RATIO; IMPURITIES; ION IMPLANTATION; MAGNETIC FIELDS; POLARIZATION; SILICON

1265 (INIS-mf–14386, pp. WP02) **Two dimensional antiferromagnetic ordering in MnPS3.** Wildes, A.R. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Hicks, T.J.; Kennedy, S.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CRYSTAL STRUCTURE/neutron diffraction; MANGANESE COMPOUNDS/antiferromagnetism; MANGANESE COMPOUNDS/crystal structure; ANISOTROPY; ISING MODEL; MAGNETIC SUSCEPTIBILITY; ANTIFERROMAGNETISM; PHOSPHIDES; SULFIDES; TEMPERATURE DEPENDENCE; TWO-DIMENSIONAL CALCULATIONS

1266 (INIS-mf–14386, pp. TP01) **Investigation of ferro electricity in $(CH_3 NH_3)HgCl_3$.** Jiang, Z.T. (La Trobe Univ., Bundoora, VIC (Australia)); James, B.D.; Liesegang, J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. MERCURY HALIDES/ammonium halides; MERCURY HALIDES/piezoelectricity; BINDING ENERGY; CALORIMETRY; CRYSTAL-PHASE TRANSFORMATIONS; FERROELECTRIC MATERIALS; INFRARED SPECTRA; PIEZOELECTRICITY; ORDER-DISORDER TRANSFORMATIONS; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE DEPENDENCE; X-RAY DIFFRACTION

1267 (INIS-mf–14386, pp. TP07) **Stability of polypyrrole tapes at high current densities.** Ediriweera, R.N. (University of Technology, Sydney, NSW (Australia)); Unsworth, J.; Conn, C.; Money, E. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. PYRROLES/current density; PYRROLES/sulfonic acids; THIN FILMS/pyrroles; DOPED MATERIALS; ELECTRIC CONDUCTIVITY; ORGANIC POLYMERS; PHASE STABILITY; PYRROLES; SURFACE COATING; TOLUENE

1268 (INIS-mf–14386, pp. TM04) **How do the oxides and fullerides superconduct?.** Das, M.P. (Australian National Univ., Canberra, ACT (Australia). Research School of Physical Sciences). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/fullerenes; HIGH-TC SUPERCONDUCTORS/oxides; SUPERCONDUCTIVITY/mathematical models; DATA COVARIANCES; EVALUATED DATA; EXPERIMENTAL DATA; FULLERENES; OXIDES; SUPERCONDUCTIVITY

1269 (INIS-mf–14386, pp. WP16) **New feature in the magnetoresistance of silicon.** Miller, D.J. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Lobb, J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SCHOTTKY BARRIER DIODES/silicon diodes; SILICON DIODES/magnetic resonance; SILICON DIODES/recombination; ISOTOPIC EXCHANGE; POSITION SENSITIVE DETECTORS; RECOMBINATION; SPACE CHARGE; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

1270 (INIS-mf–14386, pp. WP30) **Spin glass behaviour in (Mn, Mg)S.** Etheridge, G.T. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Hicks, T.J.; Kennedy, S.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. MANGANESE SULFIDES/magnesium sulfides; MANGANESE SULFIDES/spin glass state; ANTIFERROMAGNETISM; FCC LATTICES; MAGNETIC SUSCEPTIBILITY; NEUTRON DIFFRACTION; ORDER-DISORDER TRANSFORMATIONS; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE DEPENDENCE

1271 (INIS-mf–14386, pp. WP57) **Current-voltage characteristics of porous silicon.** Sabet-Dariani, R. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); McAlpine, N.S.; Haneman, D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. SILICON/electric potential; SILICON/porous materials; ANNEALING; ELECTRIC CONDUCTIVITY; ELECTROLUMINESCENCE; SILICON

1272 (INIS-mf–14386, pp. WP62) **Heterojunctions of Cd Se and amorphous silicon.** Wu, S. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Haneman, D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. CADMIUM SELENIDES/heterojunctions; SILICON/heterojunctions; AMORPHOUS STATE; HETEROJUNCTIONS; CAPACITANCE; HYDROGENATION; P-N JUNCTIONS; PHOTOEMISSION; SILICON

1273 (INIS-mf–14386, pp. WP70) **Contact anomalies in the integral quantum Hall Effect.** Ricketts, B.W. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Sovierzoski, M.M.R.; Macks, L.D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. ELECTRIC BRIDGES/hall effect; GALLIUM ARSENIDES/electric bridges; ALUMINIUM COMPOUNDS; DIFFUSION; ELECTRIC CONTACTS; INDIUM ADDITIONS; QUANTUM MECHANICS

1274 (INIS-mf–14386, pp. TP06) **Thermal characteristics of electric cables with polypyrrole coated conductors.** Ediriweera, R.N. (University of Technology, Sydney, NSW (Australia)); Conn, C.; Unsworth, J.; Tanos, G. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRIC CABLES/pyrroles; ELECTRIC CABLES/surface coating; PYRROLES/thermal conductivity; COPPER; DOPED MATERIALS; PYRROLES; ORGANIC POLYMERS; SULFONIC ACIDS; THERMAL INSULATION

1275 (INIS-mf–14386, pp. TP09) **Determination of thin film optical constants using variable angle reflectance.** Digatch, S. (University of Technology, Sydney, NSW (Australia)); Skryabin, I.; Smith, G.B.; Bell, J.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. GLASS/reflective coatings; REFLECTIVE COATINGS/optical properties; GLASS; INCIDENCE ANGLE; LIGHT TRANSMISSION; OPACITY; REFLECTIVITY; REFRACTIVE INDEX; THIN FILMS

1276 (INIS-mf–14386, pp. TP10) **Multilayer thin film colour selective filters.** Barczynska, J. (University of Technology, Sydney, NSW (Australia)); Bell, J.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. GLASS/electric filters; GLASS/optical properties; GLASS/reflective coatings; REFLECTIVE COATINGS/sol-gel process; COLOR; GLASS; SURFACE COATING; THICKNESS

1277 (INIS-mf–14386, pp. WP45) **The influence of ion, electron and photon irradiation on the level of hydrogen at the interface of metal-semiconductor systems.** McCubbery, M.D. (La Trobe Univ., Bundoora, VIC (Australia)); Nyberg, G.L.; Williams, J.S. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics.*

Eighteenth annual condensed matter physics meeting. Order Number DE95605568.

Short communication. 6 refs. SEMICONDUCTOR MATERIALS/chemical radiation effects; SEMICONDUCTOR MATERIALS/irradiation; SEMICONDUCTOR MATERIALS/thin films; ADHESION; BONDING; ELASTIC SCATTERING; ELECTRON BEAMS; HYDROGEN; ION BEAMS; METALS; PHOTON BEAMS; RECOILS; RUTHERFORD SCATTERING; SECONDARY EMISSION; IRRADIATION

1278 (INIS-mf–14393, pp. 86-87) **Uranyl complexes with heterocyclic carboxylic acids: The crystal and molecular structure of uranyl dinicotinate dihydrate.** Allock, N.W. (Warwick Univ., Coventry (United Kingdom)); Kemp, T.J.; Leciejewicz, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 fig. URANYL COMPLEXES/crystal structure; URANYL COMPLEXES/molecular structure; HETEROCYCLIC ACIDS; X-RAY DIFFRACTION

1279 (INIS-UA–005, pp. 46-50) **Investigation of thermal conductivity in polymer-ceramic HTSC composites.** Topchiashvili, M.I. (AN Ukrainskoj SSR, Kharkov (Ukraine). Fiziko-Tekhnicheskij Inst. Nizkikh Temperatur); Kiyanenko, V.V.; Ter-Grigoryan, S.A.; Kushashvili, Zh.K.; Mogilyanskij, D.N.; Rusanov, K.V.; Tyurina, E.G. Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst. 1992. 67p. (In Russian). In *Nuclear-physical researches (Theory and experiments).Scientific-technical collection.* Order Number DE95605766. Source: OSTI; NTIS (US Sales Only); INIS.

Thermal conductivity of Y Ba_2 Cu_3 O_x composites with silicon-organic tie at up to 40% of volume concentration in 80...300 K temperature range was investigated.

1280 (IS-M–806) **The role of microcracking on the crack growth resistance of brittle solids and composites.** Biner, S.B. Ames Lab., IA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001678. Source: OSTI; NTIS; INIS; GPO Dep.

A set of numerical analyses of crack growth was preformed to elucidate the influence of microcracking on the fracture behavior of microcracking brittle solids and composites. The random nucleation, orientation and size effects of discrete nucleating microcracks and resulting interactions are fully accounted for in a hybrid finite element model. The results obtained from the finite element analysis are compared with the continuum description of the microcracking. Although continuum description can provide a reasonable estimation of shielding, it fails to resolve the details of micromechanism of toughening resulting from microcracking, since not every shielding event during the course of crack extension corresponds to an increase in the R-curve. Moreover, as seen in the composite cases, the local events leading to toughening behavior may not be associated with the microcracking even in the presence of a large population of microcracks.

1281 (Juel–2751) **Fabrication and characterization of contact layers in amorphous silicon solar cells.** Kolter, M. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Schicht- und Ionentechnik. Apr 1993. 63p. (In German). Order Number DE95711839. Source: OSTI; NTIS (US Sales Only); INIS.

The production and characterisation of amorphous and microcrystalline n-doped layers (a-Si:H(n) and c-Si:H(n)) for thin film solar cells is described together contact investigations. The layers were produced in a plasma CVD. The electric conductivity was measured.

1282 (LAPP-EXP–94-01) **Spectroscopy and origin of radiating centers in $PbWO_4$ single crystals.** Korzhik, M.V. (Institute of Nuclear Problems, Minsk (Belarus)); Pavlenko, V.B.; Timoschenko, T.N.; Annenkov, A.N.; Ligun, V.A.; Fyodorov, A.A.; Peigneux, J.P. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Jan 1994. [27p.] Order Number DE95605936. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physica Status Solidi A (DE).

Further studies on the structure of single crystal $PbWO_4$ and on the origin of its luminescent radiating centres are presented. Detailed investigations of excitation spectra of luminescent bands and polarisation measurements have confirmed the previously observed double green band and have established their origin in WO_3 group transitions. The role of Pb^{3+} ions in absorption spectra and in luminescence decay is shown. A level scheme is proposed for the $PbWO_4$ luminescence. (authors) 19 refs., 16 figs., 3 tabs.

1283 (LBL–35358) **Photoluminescence under pressure and annealing of nitrogen-doped ZnSe.** Chen, A.L. (Lawrence Berkeley Lab., CA (United States). Materials Sciences Div.); Walukiewicz, W.; Haller, E.E.; Luo, H.; Karczewski, G.; Furdyna, J. Lawrence Berkeley Lab., CA (United States). Jul 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9408155–9: 22. international conference on physics of semiconductors, Vancouver (Canada), 15-19 Aug 1994). Order Number DE95002355. Source: OSTI; NTIS; GPO Dep.

The authors report photoluminescence measurement of MBE-grown nitrogen-doped ZnSe under hydrostatic stress. They determined the pressure coefficients of two separate donor-acceptor pair transitions in these samples. The results indicate that the deeper transition is caused by a localized donor that moves further into the band gap with increasing pressure, confirming that it stems from a localized donor. They also show that annealing at temperatures above 325 C produces this donor and results in compensation of the acceptor.

1284 (LBL–35433) **Characterization of inactive carbon in GaAs.** Moll, A.J. (Lawrence Berkeley Lab., CA (United States)); Haller, E.E.; Ager, J.W. III; Yu, K.M.; Walukiewicz, W. Lawrence Berkeley Lab., CA (United States). Jul 1994. 6p. Sponsored by USDOE, Washington, DC (United States);Intel Foundation (United States). DOE Contract AC03-76SF00098. (CONF-940981–3: 21. international symposium on compound semiconductors, San Diego, CA (United States), 18-22 Sep 1994). Order Number DE95002352. Source: OSTI; NTIS; GPO Dep.

Independent of the doping technique, the electrical efficiency of C-doped GaAs is less than 100%. We have shown that Raman spectroscopy provides direct evidence for the formation of C precipitates in GaAs. GaAs samples doped with C and annealed at various temperatures exhibit two broad peaks in the Raman spectra at 1585 cm^{-1} and 1355 cm^{-1} which are characteristic of two sp^2 bonded C atoms. Photoluminescence of annealed C-doped GaAs indicates the presence of compensating defects as well. Both precipitation of C and compensation due to native defects play a role in the reduction of the electrical activity of C-doped GaAs.

1285 (SAND–94-0294) **Analysis of experimentally shocked minerals by NMR spectroscopy.** Cygan, R.T.; Boslough, M.B. Sandia National Labs., Albuquerque, NM (United States). 1 Oct 1994. 110p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002955. Source: OSTI; NTIS; GPO Dep.

The shock-loading of natural materials by an impact or explosion can result in the formation of modified and altered phases. In order to characterize the resulting material and to evaluate the extent of shock modification, the authors have used nuclear magnetic resonance (NMR) spectroscopy to examine several experimentally shocked minerals. In three related NMR studies, they have (1) examined shocked clinoptilolite, (2) performed a preliminary analysis of shocked quartz, and (3) reproduced shocked quartz results with detailed spectral deconvolutions, and extended it with NMR analysis of shocked feldspar powders.

1286 (SAND–94-1280C) **Defect production and recombination during low-energy ion processing.** Kellerman, B.K. (Sandia National Labs., Albuquerque, NM (United States)); Floro, J.A.; Chason, E.; Brice, D.K.; Picraux, S.T.; White, J.M. Sandia National Labs., Albuquerque, NM (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941001–3: 41. annual American Vacuum Society symposium, Denver, CO (United States), 24-28 Oct 1994). Order Number DE95001827. Source: OSTI; NTIS; GPO Dep.

Low-energy ion processing produces damaged, microroughened semiconductor surfaces due to the production of point defects. The authors present a study of point defect production and annealing on the Ge(001)-2x1 surface during low-energy inert ion bombardment as a function of ion energy, ion mass and substrate temperature. Ion-induced surface point defect production was quantified experimentally in real time using in situ Reflection High Energy Electron Diffraction. The observed surface defect yield decreased abruptly around room temperature as the substrate temperature was increased from 175 K to 475 K. The authors have developed Monte Carlo simulations of defect diffusion to model defect recombination both in the bulk and on the surface. Bulk defect production statistics generated by a binary collision simulator, TRIMRC, were coupled with our bulk diffusion simulator to predict the number of ion-induced surface defects. A comparison between the experimental results and the simulation predictions indicated that defects produced in the bulk may represent a significant contribution to the observed surface defect yield and suggested that TRIMRC may overestimate the depth distribution of the defects. The simulations further indicated that the abrupt drop in the experimental yield with increasing substrate temperature does not arise from bulk defect recombination. The Monte Carlo simulations of surface diffusion (applicable to any crystalline surface) support a defect annealing mechanism (at low ion fluxes) that involves surface recombination of defects generated within a single cascade.

1287 (SAND–94-1318C) **Plasma-induced-damage of GaAs during etching of refractory metal contacts.** Shul, R.J. (Sandia National Labs., Albuquerque, NM (United States)); Lovejoy, M.L.; Baca, A.G.; Zolper, J.C.; Rieger, D.J.; Hafich, M.J.; Corless, R.F.; Vartuli, C.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941001–1: 41. annual American Vacuum Society symposium, Denver, CO (United States), 24-28 Oct 1994). Order Number DE95001525. Source: OSTI; NTIS; GPO Dep.

The effect of plasma-induced-damage on the majority carrier transport properties of GaAs has been studied by monitoring changes in sheet resistance (R_s) of thin conducting layers under various plasma conditions including etch conditions for refractory metal contacts. R_s determined from transmission line measurements are used to evaluate plasma-induced-damage for electron cyclotron resonance (ECR) and reactive ion etch (RIE) conditions by varying the thickness of doped epitaxial layers. The authors speculate that plasma-induced-damage in the near surface region plays a major role in explaining the damage mechanism observed in this study. Very consistent trends have been observed where R_s increases with increasing ECR and RIE dc-bias, increasing microwave power, and decreasing pressure, thus showing R_s increases as either the ion energy or ion flux increases. The authors have also observed that R_s is lower for samples exposed to the RIE than the ECR, possibly due to higher ion and electron densities generated in the ECR and higher pressures in the RIE. It has also been observed R_s dependence on ECR plasma chemistry where, R_s is lower in SF_6/Ar plasmas than Ar and N_2 plasmas possibly related to interactions of F or S atoms with the GaAs surface. Moderate anneal temperatures (200 to 500°C) have shown significant R_s recovery.

1288 (SAND–94-1607) **The numerical integration and 3-D finite element formulation of a viscoelastic model of glass.** Chambers, R.S. Sandia National Labs., Albuquerque, NM (United States). Aug 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002588. Source: OSTI; NTIS; GPO Dep.

The use of glasses is widespread in making hermetic, insulating seals for many electronic components. Flat panel displays and fiber optic connectors are other products utilizing glass as a structural element. When glass is cooled from sealing temperatures, residual stresses are generated due to mismatches in thermal shrinkage created by the dissimilar material properties of the adjoining materials. Because glass is such a brittle material at room temperature, tensile residual stresses must be kept small to ensure durability and avoid cracking. Although production designs and the required manufacturing process development can be deduced empirically, this is an expensive and time consuming process that does not necessarily lead to an optimal design. Agile manufacturing demands that analyses be used to reduce development costs and schedules by providing insight and guiding the design process through the development cycle. To make these gains, however, viscoelastic models of glass must be available along with the right tool to use them. A viscoelastic model of glass can be used to simulate the stress and volume relaxation that occurs at elevated temperatures as the molecular structure of the glass seeks to equilibrate to the state of the supercooled liquid. The substance of the numerical treatment needed to support the implementation of the model in a 3-D finite element program is presented herein. An accurate second-order, central difference integrator is proposed for the constitutive equations, and numerical solutions are compared to those obtained with other integrators. Inherent convergence problems are reviewed and fixes are described. The resulting algorithms are generally applicable to the broad class of viscoelastic material models. First-order error estimates are used as a basis for developing a scheme for automatic time step controls, and several demonstration problems are presented to illustrate the performance of the methodology.

1289 (UM-P–93/49) **Pulsed laser annealing of P implanted diamond.** Allen, M.G. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Prawer, S.; Jameison, D.N.; Kalish, R. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 16p. Sponsored by Australian Research Council, Canberra, ACT (Australia);Department of Industry, Technology and Commerce, Canberra, ACT (Australia). Industry Research and Development Board. Order Number DE95605947. Source: OSTI; NTIS (US Sales Only); INIS.

Diamond deeply implanted with 4 MeV P to a dose of 1×10^{15} atoms/cm^2 is annealed by a focused pulsed laser that is selectively absorbed by the implanted damaged layer. Laser treatment with multiple pulses at ever increasing power effects excellent regrowth as measured by channeling RBS, surface profilometry, and by optical transmission. The importance of the deep implantation and the potential of this method for doping diamond is demonstrated. 6 refs., 4 figs.

1290 (WHC-MR–0479) **Glass science tutorial: Lecture #1, Chemistry and properties of oxide glasses.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002963. Source: OSTI; NTIS; INIS; GPO Dep.

The tutorial covers the following topics: Definitions and terminology; Introduction to glass structure and properties; The glass transition; Structure/property relationships in oxide glasses; Generalized models for predicting structure/properties; Glass surfaces; Chemical durability; and Mechanical properties.

40 CHEMISTRY

4001 Analytical and Separations Chemistry

Refer also to citation(s) 37, 58, 159, 223, 254, 257, 258, 302, 303, 420, 591, 627, 1214, 1344, 1356, 1390, 1393, 1394, 1412, 1839, 1865, 1951

1291 (ANL/CHM/CP–81118) **Atmosphere influence on in situ ion beam analysis of thin film growth.** Lin, Yuping (Argonne National Lab., IL (United States)); Krauss, A.R.; Gruen, D.M.; Chang, R.P.H.; Auciello, O.H.; Schultz, J.A. Argonne National Lab., IL (United States). [1994]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant N00014-93-1-0591. (CONF-940440–6: International conference on metallurgical coatings and thin films, San Diego, CA (United States), 25-29 Apr 1994). Order Number DE95001507. Source: OSTI; NTIS; INIS; GPO Dep.

In situ, nondestructive surface characterization of thin-film growth processes in an environment of chemically active gas at pressures of several mTorr is required both for the understanding of growth processes in multicomponent films and layered heterostructures

and for the improvement of process reproducibility and device reliability. The authors have developed a differentially pumped pulsed ion beam surface analysis system that includes ion scattering spectroscopy (ISS) and direct recoil spectroscopy (DRS), coupled to an automated ion beam sputter-deposition system (IBSD), to study film growth processes in an environment of chemically active gas, such as required for the growth of oxide, nitride, or diamond thin films. The influence of gas-phase scattering and gas-surface interactions on the ISS and DRS signal intensity and peak shape have been studied. From the intensity variation as a function of ambient gas pressure, the authors have calculated the mean free path and the scattering cross-section for a given combination of primary ion species and ambient gas. Depending on the system geometry and the combination of primary beam and background, it is shown that surface-specific data can be obtained during thin-film growth at pressures ranging from a few mtorr to approximately 1 Torr. Detailed information such as surface composition, structure, and film growth mechanism may be obtained in real-time, making ion beam analysis an ideal nondestructive, in situ probe of thin-film growth processes.

1292 (AREAEE–305) **Size and surface AREA analysis of some metallic and intermetallic powders.** Elmasry, M.A.A.; Elsayed, A.A.; Abadir, M.F. Nuclear Research Centre, Inshas (Egypt). 1988. 22p. Order Number DE95605544. Source: OSTI; NTIS (US Sales Only); INIS.

The powder characterization of three intermetallic compounds (Cr B, B_4 c and S ib_4) and three metallic powders (Fe, Co, and Ni) has been performed. This included the determination of powder density, chemical analysis, impurity analysis, shape factor, particle size analysis and specific surface area. The particle size analysis for the six powders was carried out using three techniques, namely; the 0-23, the microtrac and the fisher sub sieve and size. It was found that the analysis of the two powders and deviates from the log-normal probability distribution and the deviation was corrected. The specific surface area of the powders was measured using the high speed surface area analysis (BET method), and it was also calculated from surface area analysis findings, the BET technique was found to give the highest specific surface area values, and was attributed to the inclusion of internal porosity in the measurement. 8 fig., 10 tab.

1293 (CONF-941129–7) **Non destructive characterization using pulsed fast-thermal neutrons.** Womble, P.C. (Oak Ridge National Lab., TN (United States)); Schultz, F.J.; Vourvopoulos, G. Oak Ridge National Lab., TN (United States); Western Kentucky Univ., Bowling Green, KY (United States). Dept. of Physics and Astronomy. [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93PC93211 ; AC05-84OR21400. From Conference on application of accelerators in research and industry; Denton, TX (United States); 7-10 Nov 1994. Order Number DE95002601. Source: OSTI; NTIS; GPO Dep.

It has been shown that explosives, illicit drugs, and other contraband materials contain various chemical elements in quantities and ratios that differentiate them from each other and from other innocuous substances. In coal, the major chemical elements in it can provide information about various parameters of importance to the coal industry. In both examples, the nondestructive identification of chemical elements can be performed by utilizing incident pulsed fast-thermal neutrons that, through nuclear reactions, excite the nuclei of the various elements. This technique is being currently developed for dismantling of nuclear weapons classified as trainer's, and for on-line coal bulk analysis.

1294 (DOE/ER/13289–T2) **Model studies of hydrodesulfurization by Mo: The effect of promoters: Progress report, December 1, 1993–November 30, 1994.** Friend, C.M. Harvard Univ., Cambridge, MA (United States). Dept. of Chemistry. [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER13289. Order Number DE95002597. Source: OSTI; NTIS; GPO Dep.

Our recent work has focused on understanding how modifiers, such as S and Co, affect the mechanisms, and thereby the kinetics and selectivity, for desulfurization. Cobalt and sulfur are of particular importance because they are components of the working hydrodesulfurization catalyst. Our approach is to prepare well-defined overlayers of the modifiers that exhibit chemical differences analogous to the promotion effects observed in working catalysts. By investigating well-defined surfaces under ultrahigh vacuum, we can develop a molecular-level model of the reaction mechanisms for specific types of coordination environments. Surface spectroscopies, such as high resolution electron energy loss, x-ray photoelectron, and temperature programmed reaction, are used to define the mechanistic details.

1295 (DOE/ER/13434–T2) **Development of laser-ion beam photodissociation methods: Progress report, December 1991–November 1994.** Russell, D.H. Texas A and M Univ., College Station, TX (United States). Dept. of Chemistry. Jun 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-85ER13434. Order Number DE95002800. Source: OSTI; NTIS; GPO Dep.

This project emphasizes the development of laser mass spectrometry methods for fundamental and applied studies of gas-phase processes. The current studies are focussed on the photochemistry and photophysics of peptides and other biological molecules. Matrix-assisted laser desorption ionization (MALDI) is used to produce ions that are subsequently subjected to photoexcitation and dissociation. MALDI is still very much in the developmental stages, thus a significant portion of this research focusses on fundamental studies of the MALDI ion formation/energy transfer process. The authors' view is that excited state H^+-transfer reactions play an important role in MALDI, consequently a significant portion of research activities are focussed on such studies. Fundamental studies of the role of the matrix in MALDI are an integral part of this project. A new MALDI experiment, MALDI of aerosol particles generated from solutions, has been demonstrated and new developmental research in this area is planned. The authors are also actively pursuing a research program on gas-phase H^+-transfer processes that mimic the MALDI process. In addition, the authors are developing photodissociation experiments, based on tandem time-of-flight mass spectrometers, for structural characterization of complex organic molecules. The photodissociation studies use MALDI as the ionization method. These research areas involve the development of new instrumentation, new instrument methodologies, and data processing.

1296 (DOE/ER/14333–T1) **Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994.** Harris, J.M. Utah Univ., Salt Lake City, UT (United States). Dept. of Chemistry. 31 Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER14333. Order Number DE95002255. Source: OSTI; NTIS; GPO Dep.

A number of chemical phenomena that occur at the boundaries between insulating solids and liquids (adsorption, partition, monolayer self-assembly, catalysis, and chemical reactions) are important to energy-related analytical chemistry. These phenomena are central to the development and understanding of chromatographic methods, solid-phase extraction techniques, immobilized analytical reagents, and optical sensors. The goal of this program, therefore, is to develop surface-sensitive spectroscopies by which chemical kinetics at liquid/solid interfaces can be observed on time-scales from nanoseconds to seconds. In the second year of this program, the authors have used temperature-jump relaxation measurements to monitor adsorption/desorption kinetics at liquid/solid interfaces using Joule heating to compare the adsorption of ions from solution onto C1- and C4-derivatized silica surfaces. They completed a study of rate of migration of covalently-attached ligands on silica surfaces; from the temperature-dependence of the migration, the large energy barrier to migration was estimated. Surface heterogeneity of adsorption sites on silica was characterized by time-resolve fluorescence, and the chemical origins investigated by Si^{29} NMR spectroscopy. Surface-enhance Raman and fluorescence spectroscopies were modified to study adsorption and binding to silica surfaces. Molecular dynamics simulations were started to help better understand kinetic barriers to adsorption; ESR probe measurements were launched to measure and compare the chain mobility of silica-attached alkyl ligands.

1297 (DOE/PC/90311–16) **Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Sixteenth quarterly report, 14 May–13 August 1994.** Miller, J.D. Utah Univ., Salt Lake City, UT (United States). 10 Oct 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-90PC90311. Order Number DE95002641. Source: OSTI; NTIS; GPO Dep.

The axial flow reversal was studied using tracer injection and results correlation with x-ray CT and flotation. Effects of dimensionless area ratio and flow rate ratio, percent solids in feed, and inlet pressure on location of surface of zero axial velocity in the ASH were studied. 4 figs.

1298 (FRCEA-TH–408) **Hydrodynamic operation analysis of a pulse with disks and rings column.** Milot, J.F. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. d'Exploitation du Retraitement et de Demantelement; Institut National Polytechnique, 31 - Toulouse (France). 30 Oct 1990. 188p. (In French). Order Number DE95603231. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of this work is to analyse the measurements of the pressure sensors of a pulse liquid-liquid extraction column and to improve the understanding of its hydraulic behaviour. The first part studies the average differential pressure measurements. The influence of phase flows, of pulsating conditions and of retention rate on these measurements is taken into consideration in a simplified modelling of pressure signal. The second part studies the simulation of the scattered phase behaviour. A balance on the drop population allows to establish the size classification of drops and the retention in every column point. The comparison between the experimental results and the obtained simulations with the same operational conditions allows to test the validity of the proposed modellings. 56 refs., 118 figs., 19 tabs., 8 annexes.

1299 (GSI–94-59(prepr.)) **Modeling a nielsbohrium (element 107) on-line gas phase separation procedure with rhenium.** Schaedel, M.; Jaeger, E.; Schimpf, E.; Bruechle, W. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 21p. Order Number DE95715045. Source: OSTI; NTIS (US Sales Only); INIS.

As a basis for future heavy element experiments off-line tracer studies with rhenium have been carried out to model the chemical behavior of nielsbohrium (element 107) in thermochromatographic separations with oxygen as a reactive gas. A specific version of the On-Line Gas Phase Separation Apparatus, OLGA, has been developed to perform on-line chemical separations of short-lived products from heavy ion nuclear reactions, and to enable α-spectroscopic measurements of the separated products after condensation on thin foils. (orig.)

1300 (INIS-BR–3436) **An improved method for determination of uranium isotopic composition in urine by alpha spectrometry.** Duarte, C.L.; Szeles, M.S.M.F. Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). [1994]. 11p. Order Number DE95603146. Source: OSTI; NTIS (US Sales Only); INIS.

A comparative study of source preparation techniques to determine uranium isotopic composition by alpha spectrometry, namely electrodeposition and chemical stripping with polymeric membrane containing trioctylphosphine oxide (TOPO), is presented. The mean yield obtained for electrodeposition and TOPO deposition were 85% and 74%, respectively. The mean activity ratio $^{235}U/^{238}U$ were 0.044 and 0.042 and the ratio $^{234}U/^{238}U$ were 0.994 and 1.009, using electrodeposition and TOPO deposition techniques, respectively. The method of uranium separation from urine using an ion-exchange resin Dowex 1 x 8, chloride form and citrate form, was also studied. The obtained global yields of these methods were 50% and 41%, respectively. (author).

1301 (INIS-BR–3443) **Rb-Sr measurements on metamorphic rocks from the Barro Alto Complex, Goias, Brazil.** Fuck, R.A. (Brasilia Univ., DF (Brazil). Dept. de Geociencias); Neves, B.B.B.; Cordani, U.G.; Kawashita, K. Brasilia Univ., DF (Brazil). Dept. de Geociencias. 1988. 8p. (CONF-880010–: International conference on geochemical evolution of the continental crust, Poco de Caldas (Brazil), 1988). Order Number DE95603147. Source: OSTI; NTIS (US Sales Only); INIS.

The Barro Alto Complex comprises a highly deformed and metamorphosed association of plutonic, volcanic, and sedimentary rocks exposed in a 150 x 25 Km boomerang-like strip in Central Goias, Brazil. It is the southernmost tip of an extensive yet discontinuous belt of granulite and amphibolite facies metamorphic rocks which include the Niquelandia and Cana Brava complexes to the north. Two rock associations are distinguished within the granulite belt. The first one comprises a sequence of fine-grained mafic granulite, hypersthene-quartz-feldspar granulite, garnet quartzite, sillimanite-garnet-cordierite gneiss, calc-silicate rock, and magnetite-rich iron formation. The second association comprises medium-to coarse-grained mafic rocks. The medium-grade rocks of the western/northern portion (Barro Alto Complex) comprise both layered mafic rocks and a volcanic-sedimentary sequence, deformed and metamorphosed under amphibolite facies conditions. The fine-grained amphibolite form the basal part of the Juscelandia meta volcanic-sedimentary sequence. A geochronologic investigation by the Rb-Sr method has been carried out mainly on felsic rocks from the granulite belt and gneisses of the Juscelandia sequence. The analytical results for the Juscelandia sequence are presented. Isotope results for rocks from different outcrops along the gneiss layer near Juscelandia are also presented. In conclusion, Rb-Sr isotope measurements suggest that the Barro Alto rocks have undergone at least one important metamorphic event during Middle Proterozoic times, around 1300 Ma ago. During that event volcanic and sedimentary rocks of the Juscelandia sequence, as well as the underlying gabbro-anorthosite layered complex, underwent deformation and recrystallization under amphibolite facies conditions. (author).

1302 (INIS-JP–024, pp. A610/1-A610/12) **Isotopic approach to the provenance study of artifacts.** Mabuchi, Hisao (Sakuyo Junior Coll., Tuyama, Okayama (Japan)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Isotopic abundance ratios, which are proved to be generally constant, are known to vary, for certain elements, from one place to another. Light elements, such as hydrogen, lithium, boron, carbon, nitrogen, oxygen and sulfur, show measurable variations of their isotope ratios due to isotopic fractionation which takes place during geochemical or biochemical processes. Isotope ratios of strontium and lead vary due to the decay of long-lived radioactive nuclides ^{87}Rb and ^{238}U-^{235}U-^{232}Th, respectively. Such isotopic anomalies can be applicable to provenance studies of archaeological objects. Thus, $^{13}C/^{12}C$, $^{18}O/^{16}O$, or $^{87}Sr/^{86}Sr$ were used to examine the authenticity of Greek marble statues. Also, lead isotope ratios have been used since mid-1960s extensively for provenance studies of glasses and bronzes of different civilizations. As an example, the author presents a series of his own works on lead isotope ratios applied to ancient Japanese bronzes, which are summarized as follows. (1) It was generally observed that lead isotope ratios reflect difference in culture to which bronzes belong. (2) Mirrors in the Western Han period (206 B.C. - A.D.8) are clearly distinguished by lead isotope ratios from those made after the mid-Eastern Han period (ca.A.D.150 - 300). (3) Korean mirrors and weapons excavated from the Yayoi sites contain lead of easily recognizable Mississippi Valley type. (4) Bronze objects made in Japan (imitative Han style mirrors, Dotaku, imitative weapons, arrowheads etc.) in the Yayoi and Kofun periods are classified by lead isotope ratios in the following order: the Korean mirror type to the Western Han mirror type in the Yayoi period and the mid- to post- Han mirror type in the Kofun period. (5) Indigenous Japanese lead seems to have been used after the mid-7th century. (J.P.N.).

1303 (INIS-JP–024, pp. A620/1-A620/11) **Aspect of human food ecology: Development of carbon and nitrogen isotope method.** Minagawa, Masao (Hokkaido Univ., Sapporo (Japan)).

Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

The isotopic dietary analysis was applied for some prehistoric human populations from East Asia, Latin America, and Oceania region. Most samples were from archeological sites from 1000 to 6000 year's bp. Some modern ethnological groups including Tibet, Kurud, Shelpa and Tlingit were also studied for evaluating prehistoric human food habit. Carbon and nitrogen isotope compositions of gelatin fractions have been analyzed for prehistoric bone samples. Analytical procedure for isotopes and data analyses for reconstructing dietary composition was developed and tested by a modern human food system. A stochastic method based on the Monte Carlo model was applied to estimate dependency of major food resources having unique isotope compositions in carbon and nitrogen, and has showed consistent results to the statistic food consumption record in Japan. Carbon and nitrogen isotope composition of human tissues showed distinct difference among human groups in both prehistoric and modern samples. These data were evaluated by difference of dietary patterns: contributions of marine food, terrestrial food, meat, C3 and C4 plant, which are characterized by the difference of ^{13}C and ^{15}N content. On the basis of the stochastic feeding simulation, dietary consumption patterns were estimated for Jomon fisher-hunter-gatherers, historic Ainu, prehistoric east Siberian, prehistoric Latin American farmers in Mexico and Peru, and prehistoric fisheres in Cook island. Results showed a remarkable relationship between animal protein dependence and marine food usage. This result will be discussed from following two possibilities; the human adaptation on marine resources would be one of the important direction to upgrade animal protein uptake, or marine food could be used as alternative protein source for terrestrial game animals. (author).

1304 (INIS-JP–024, pp. A630/1-A630/16) **New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry.** Nakamura, Toshio (Nagoya Univ. (Japan). Dating and Materials Research Center). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

In archeology, radiocarbon (^{14}C) dating has played a very important role since its appearance in the 1950s, in particular, in extending the Neolithic period to almost double its accepted length. In addition, chronologies of pre-historic events can be correlated among various sites in different countries of the world, bu using ^{14}C dates. Techniques of accelerator mass spectrometry (AMS), developed since 1977, based mainly on a tandem accelerator and associated apparatus used to analyze charge state, energy, mass number, and atomic number of accelerated ions, enabled us to measure extremely-low-abundance nuclides such as ^{10}Be, ^{14}C, ^{26}Al, ^{36}Cl, ^{41}Ca, ^{53}Mn, ^{129}I, etc., in natural samples. The main AMS application is ^{14}C measurement, and in particular, ^{14}C dating. The amount of carbon necessary for the AMS ^{14}C measurement has been reduced to 1 mg and the oldest date measurable has been extended to about 60,000 y.B.P., compared to a few grams and about 35,000 y.B.P., respectively, for β-counting measurements of ^{14}C. A tandetron accelerator mass spectrometer, constructed by the General Ionex Corporation, USA, was installed at Nagoya University in 1982, to measure ^{14}C dates of archeological and geological samples. Measurements of ^{14}C were started in the fall of 1983. Routinely, about 600 samples are measured per year, and in total 4132 samples have been analyzed up to October 1993. The present performance and various applications of the spectrometer for ^{14}C dating are described. Some programs for improving the spectrometer and some plans for scientific research are also discussed. (author) 51 refs.

1305 (INIS-mf–14340, pp. 82-94) **Low-cost nuclear technique for lignite ash determination.** Chankow, N. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology). Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Determination of ash content in lignite samples using beta backscattering technique was investigated. A 37 kBq $^{90}Sr/^{90}Y$ source and lignite samples from Mae Moh Mine in Lampang Province were used in this study. It was found that the intensity of backscattered beta was directly proportional to the ash content for 35 lignite samples used for calibration with the correlation coefficient of >0.97. Then the ash contents of 31 lignite samples were determined using the standard chemical method for comparison. It was found that there were only 10 out of 31 samples with discrepancies greater than 5%. The results indicated the feasibility of developing a low-cost device for quick estimate of ash content in lignite.

1306 (INIS-mf–14340, pp. 205-213) **Adsorption of silver ion on activated carbon via radiochemical method.** Sai-ubol, N. (Chiang Mai Univ., Faculty of Science, Dept. of Chemistry (Thailand)); Panyo, O. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

The adsorption of silver nitrate solution on activated carbon using $^{110m}AgNO_3$ has been investigated within the initial concentration range of 0.001-0.1 mol dm^{-3}. It is found that the amount of adsorption increases gradually with concentration. The monolayer coverage determined by Langmuir's adsorption isotherm is found to be $8.7x10^{-6}$ mol Ag^+/mg C. When using Freundlich's adsorption isotherm, linear plots consisted of two parts have been observed. It may be concluded that due to heterogeneous surfaces, the adsorbed ions can rearrange themselves on the surfaces.

1307 (INIS-mf–14340, pp. 214-220) **New continuous analysis for radio-release technique.** Grudpan, K. (Chaing Mai Univ., Fac. of Science, Dept. of Chemistry (Thailand)). Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

"Radio release (RR)" technique has been found in various applications in analysis for long time ago, but not yet adapted in a continuous analyzer. This paper will describe our first development in merging the RR method to a new continuous technique, namely flow injection analysis (FIA). Instrumentation and the application of RR for vanadium determination by FIA will be discussed.

1308 (INIS-mf–14340, pp. 221-228) **Some studies on extractive liquid scintillation counting for Th-234/P-234m.** Grudpan, K. (Chiang Mai Univ, Faculty of Science, Dept. of Chemistry (Thailand)); Singjanusong, P.; Punyodom, W. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

A study on solvent extraction for Th-234/Pa-234m by liquid scintillation counting has not been reported. This paper will report an application of the technique on such a study. In a hydrochloric acid solution of an uranyl salt, Pa-234m which is one of the daughters of U-238 can be separated by extraction into isobutyl methyl ketone (IBMK). Cerenkov counting was applied for the extraction investigation. Solvent extraction of Th-234/Pa-234m from an aqueous nitric acid solution by TOPO/PPO in toluene by using liquid scintillation counting will be described.

1309 (INIS-mf–14340, pp. 266-278) **Determination of ash content in lignite using gamma-ray transmission technique.** Chantree, K. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Sumitra, T.; Chankow, N. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

A method for determining ash content in lignite using gamma-ray transmission technique was investigated. The detection system consists of 2 gamma-ray point sources, a 2" x 2" NaI (Tl) detector and a single channel analyzer. The two isotopes used were a 3.7 GBg Am-241 and a 0.074 GBg Cs-137. The detector was aligned with the collimated gamma-ray beam from the sources. The sample was put directly on the detector and the distance between the collimator opening and the detector was 15 cm. A total of 54 lignite samples from Mae Moh Mine were analyzed. Ash content in lignite was found to be varying from 10 to 70 percent, with a sensitivity of 1151 net counts per percent ash. When moisture content in lignite varied within 10 percent, the ash content estimation would give an error of less than 0.4 percent for low-ash lignite, less than 10 percent ash. For the case of high-ash lignite, 40-70 percent ash, the error would be less than 3.7 percent. It could be concluded that it is feasible to develop compact and low-cost device for use in the field which could give a quick estimate of ash content in lignite.

1310 (INIS-mf–14340, pp. 280-295) **Determination of ash content in lignite using X-ray backscattering technique.** Aunvong, S. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology); Chankow, N. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

The use of X-ray backscattering technique for lignite ash determination was studied. A 1.11 GBq annular plutonium-238 X-ray source and an X-ray proportional counter were used. A HPGe detector was also used to investigate the X-ray spectra in more detail. The optimum sources-to-sample distance the minimum sample thickness and diameter were determined so as to obtain maximum backscattered X-ray intensity. It was found that the optimum distance was 9 mm whereas the minimum sample thickness was 2.1 g/cm and the minimum sample diameter was less than 4.8 cm. The effect of particle size on measurement of the backscattered X-rays was also studied. It was found that the standard deviation of the measurement was directly proportional to the particle size and the standard deviation was less than 1 percent for the particle size less than 0.833 mm which was comparable with that obtained from pulverized and compressed samples. The relationship between the backscattered X-ray intensity and ash content in lignite sample was investigated by using 34 samples with percentage of ash ranging from 14 to 65 percent. The results indicated that the backscattered X-ray intensity was inversely proportional to ash content in the sample with the correlation coefficient of 0.97. For ash content ranging from 14 to 30 percent, it was found that an increase of 1 percent iron content resulted in an increase in the reading of ash content by less than 1.2 and 5 percent respectively, whereas an increase of 1 percent moisture content resulted in a decrease in the reading by less than 0.2 and 2 percent respectively. The ash content of 8 lignite samples with ash content ranging from 24 to 45 percent was determined and the results were comparable with those obtained from chemical analysis and gamma-ray transmission technique with the correlation coefficients of 0.92-0.95.

1311 (INIS-mf–14340, pp. 296-316) **Spectrophotometric determination of inactive molybdenum in sodium pertechnetate (technetium-99m) for injection.** Laohawilai, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Molybdenum is the major impurity in sodium pertechnetate (technetium-99m) for injection. If molybdenum level in human body is high, it may cause anemia disease, poor growth rate and diarrhea etc. The objective of this study is to determine the quantity of inactive molybdenum by spectrophotometric technique. Molybdenum (V) reacts with thiocyanate ion to form a red molybdenum (V) thiocyanate in 0.9-3.0 M hydrochloric acid. This complex could be enhanced by adding lignocaine hydrochloride (LH) to form a new ion association complex which could be extracted into chloroform. The complex has the maximum absorption at 465 nm. The quantity is determined by standard addition method and the optimum range is between 1-5 ppm.

1312 (INIS-mf–14340, pp. 375-383) **Study on alpha-spectrometry of transuranic elements in environmental samples.** Panyatipsakul, Y. (Office of Atomic Energy for Peace, Bangkok (Thailand)); Milintawisamai, M.; Cooper, E. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

This study describes the radioanalytical procedures of Pu-239, 240 and Am-241 which are transuranium elements, in environmental samples by using Pu-242 and Am-243 as tracers. The separations of plutonium and americium are performed by leaching; passing through Dowex1-X8, Dowex5OW-X8 and Dowex1-X4 ion exchange resins; coprecipitation and extraction with thenoyltrifluoroacetone. The sample is co-precipitated with CeF_3 in the last step for alpha-spectrometry. The results show that the separation of Pu-239, 240 by Dowex1-X8 gives chemical yield 70-90%; the separation of americium-241 by the combination of Dowex1-X8, Dowex50W-X8 and Dowex1-X4 gives chemical yield 70-95% but the yield by 2 step separation of ion exchange resins and thenoyltrifluoroacetone extraction is insignificant. The separation procedures were tested with various types of environmental samples: it is found that the purity of spectra obtained depends on sample matrix.

1313 (INIS-mf–14386, pp. WP73) **Carbon and oxygen analysis in MOCVD grown HgCdMnTe and AlGaAs by charged particle activation.** Studd, W.B. (Royal Melbourne Inst. of Tech., VIC (Australia)); Walker, S.R.; Johnston, P.N.; Bubb, I.F. [1994]. 227p. Sponsored by Australian Research Council, Canberra, ACT (Australia). (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CADMIUM TELLURIDES/carbon; CADMIUM TELLURIDES/charged-particle activation analysis; CADMIUM TELLURIDES/oxygen; GALLIUM ARSENIDES/carbon; GALLIUM ARSENIDES/charged-particle activation analysis; GALLIUM ARSENIDES/oxygen; ALPHA PARTICLES; ALUMINIUM ADDITIONS; CARBON; OXYGEN; CARBON 12 TARGET; CHEMICAL VAPOR DEPOSITION; DOPED MATERIALS; EPITAXY; FLUORINE 18; HELIUM 3 REACTIONS; IMPURITIES; MANGANESE ADDITIONS; MERCURY TELLURIDES; OXYGEN 16 TARGET; PROTONS; THIN FILMS

1314 (INIS-mf–14393, pp. 37) **Identification of 16. century paintings of the Malopolska School by means of IRNAA.** Panczyk, E. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Walis, L.; Ligeza, M. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs. NEUTRON ACTIVATION ANALYSIS/pigments; CULTURAL OBJECTS; PIGMENTS; POLAND; TRACE AMOUNTS

1315 (INIS-mf–14393, pp. 37-38) **Analysis of gaseous SO_2 and particulate Fe, Pb, S in air pollutants by XRF method.** Kierzek, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Malozewska-Bucko, B. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs., 3 figs. AIR POLLUTION/x-ray fluorescence analysis; DUSTS; IRON; LEAD; SULFUR; SULFUR DIOXIDE; VANADIUM

1316 (INIS-mf–14393, pp. 40-41) **An attempt of determination of heavy metals content in environmental samples by low resolution XRF technique.** Kowalska, E. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Urbanski, P. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 1 fig., 1 tab. X-RAY FLUORESCENCE ANALYSIS/environmental materials; ANTIMONY; CADMIUM; LEAD; MERCURY; THALLIUM; TIN; VANADIUM; ZINC

1317 (INIS-mf–14393, pp. 41-43) **Extraction of lanthanides, americium(III) and yttrium by TBP from thiocyanate and azide solutions.** Borkowski, M. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Krejzler, J.; Siekierski, S. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 9 refs., 2 figs. SOLVENT EXTRACTION/americium complexes; SOLVENT EXTRACTION/rare earth complexes; SOLVENT EXTRACTION/yttrium complexes; AZIDES; SOLUTIONS; TBP; THIOCYANATES

1318 (INIS-mf–14393, pp. 43-44) **Liquid-liquid partition and hydration of some bis and tris-β-diketonates.** Narbutt, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Bartos, B.; Siekierski, S. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 9 refs., 1 fig. SOLVENT EXTRACTION/acetylacetone; SOLVENT EXTRACTION/scandium complexes; COBALT COMPLEXES; ENTHALPY; ENTROPY; FREE ENERGY; GALLIUM COMPLEXES; HYDRATION; MANGANESE COMPLEXES; PALLADIUM COMPLEXES; PARTITION FUNCTIONS; ACETYLACETONE; ZINC COMPLEXES

1319 (INIS-mf–14393, pp. 47-48) **Separation of yttrium from strontium radionuclides on α-crystalline antimony peroxide.** Bilewicz, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Ma'ly, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 1 fig. ION EXCHANGE/radiometric analysis; ANTIMONY OXIDES; CRYSTALS; STRONTIUM 85; STRONTIUM 90; YTTRIUM 88; YTTRIUM 90

1320 (INIS-mf–14393, pp. 48-49) **Separation factors of H/D and $^{16}O/^{18}O$ in permeation of natural water through PTFE membranes.** Chmielewski, A.G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Zakrzewska-Trznadel, G.; Miljevic, N.R.; Van Hook, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. State Committee for Sci.Res. Grant No. 20497901; IAEA Technical In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs., 2 figs. ISOTOPE SEPARATION/membranes; HYDROGEN ISOTOPES; MEMBRANES; OXYGEN ISOTOPES; PERMEABILITY

1321 (INIS-mf–14393, pp. 50-51) **A trail of computer simulation of semiconductor detector gamma-ray spectra for detectability and precision prediction in instrumental neutron activation analysis.** Szopa, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Polkowska-Motrenko, H. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs., 1 tab. NEUTRON ACTIVATION ANALYSIS/optimization; COMPUTERIZED SIMULATION; GAMMA SPECTRA; OPTIMIZATION; SEMICONDUCTOR DETECTORS

1322 (INIS-mf–14393, pp. 51-52) **Determination of antimony in natural waters by neutron activation analysis after separation on a chelating sorbent.** Zmijewska, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 9 refs., 1 tab. NEUTRON ACTIVATION ANALYSIS/antimony; NEUTRON ACTIVATION ANALYSIS/environmental materials; NEUTRON ACTIVATION ANALYSIS/water pollution; ADSORBENTS; CHELATING AGENTS; ANTIMONY

1323 (INIS-mf–14393, pp. 53-54) **Elaboration of the universal method of radiochemical separation of molybdenum from irradiated biological samples for NAA purposes.** Danko, B. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Dybczynski, R.; Samczynski, Z. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 10 refs., 1 fig. EXTRACTION CHROMATOGRAPHY/molybdenum; ION EXCHANGE CHROMATOGRAPHY/molybdenum; NEUTRON ACTIVATION ANALYSIS/molybdenum; BIOLOGICAL MATERIALS; MOLYBDENUM; TRACE AMOUNTS

1324 (INIS-mf–14393, pp. 54-55) **The elaboration of the method of phosphorus and potassium determination in plant materials with the use of 14 MeV neutron generator in the new constructed laboratory dedicated for nitrogen determinations.** Wasek, M. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Hammer, W.; Szopa, Z.; Sterlinski, S.; Dybczynski, R.; Kulisa, K. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs. NEUTRON ACTIVATION ANALYSIS/phosphorus; NEUTRON ACTIVATION ANALYSIS/potassium; PHOSPHORUS; POTASSIUM; NEUTRON GENERATORS; PLANT TISSUES; QUANTITATIVE CHEMICAL ANALYSIS

1325 (INIS-mf–14393, pp. 55-57) **A study of analytical properties of chelating sorbents obtained by immobilization of chelating agents on solid supports. Analytical properties of thionalide loaded acrylic resin.** Chwastowska, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Zmijewska, W.; Sterlinska, E. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 2 figs., 1 tab. ADSORBENTS/cadmium ions; ADSORBENTS/trace amounts; ACRYLIC ACID ESTERS; ADSORBENTS; CHELATING AGENTS; METALS; POLYMERS

1326 (INIS-mf–14393, pp. 82-83) **Analysis of alloys by energy dispersive X-ray fluorescence method.** Przetakiewicz, P. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Kierzek, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 3 tabs. ALLOYS/x-ray fluorescence analysis; ALLOYS; METALS; MOLYBDENUM; NIOBIUM; TUNGSTEN; VANADIUM

1327 (IS-T–1696) **Novel absorption detection techniques for capillary electrophoresis.** Xue, Y. Iowa State Univ. of Science and Technology, Ames, IA (United States). 27 Jul 1994. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001673. Source: OSTI; NTIS; GPO Dep.

Capillary electrophoresis (CE) has emerged as one of the most versatile separation methods. However, efficient separation is not sufficient unless coupled to adequate detection. The narrow inner diameter (I.D.) of the capillary column raises a big challenge to detection methods. For UV-vis absorption detection, the concentration sensitivity is only at the μM level. Most commercial CE instruments are equipped with incoherent UV-vis lamps. Low-brightness, instability and inefficient coupling of the light source with the capillary limit the further improvement of UV-vis absorption detection in CE. The goals of this research have been to show the utility of laser-based absorption detection. The approaches involve: on-column

double-beam laser absorption detection and its application to the detection of small ions and proteins, and absorption detection with the bubble-shaped flow cell.

1328 (IS-T–1701) **Studies of selenium and xenon in inductively coupled plasma mass spectrometry.** Bricker, T. Iowa State Univ. of Science and Technology, Ames, IA (United States). 27 Jul 1994. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001676. Source: OSTI; NTIS; INIS; GPO Dep.

Since its development, inductively coupled plasma mass spectrometry (ICP-MS) has been a widely used analytical technique. ICP-MS offers low detection limits, easy determination of isotope ratios, and simple mass spectra from analyte elements. ICP-MS has been successfully employed for many applications including geological, environmental, biological, metallurgical, food, medical, and industrial. One specific application important to many areas of study involves elemental speciation by using ICP-MS as an element specific detector interfaced to liquid chromatography. Elemental speciation information is important and cannot be obtained by atomic spectrometric methods alone which measure only the total concentration of the element present. Part 1 of this study describes the speciation of selenium in human serum by size exclusion chromatography (SEC) and detection by ICP-MS. Although ICP-MS has been widely sued, room for improvement still exists. Difficulties in ICP-MS include noise in the background, matrix effects, clogging of the sampling orifice with deposited solids, and spectral interference caused by polyatomic ions. Previous work has shown that the addition of xenon into the central channel of the ICP decreases polyatomic ion levels. In Part 2 of this work, a fundamental study involving the measurement of the excitation temperature is carried out to further understand xenon's role in the reduction of polyatomic ions. 155 refs.

1329 (IS-T–1712) **Liquid chromatographic method for determination of water in soils and the optimization of anion separations by capillary zone electrophoresis.** Benz, N. Ames Lab., IA (United States). [1994]. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001663. Source: OSTI; NTIS; GPO Dep.

A liquid chromatographic method for the determination of water in soil or clay samples is presented. In a separate study, the optimization of electrophoretic separation of alkylated phenolate ions was optimized by varying the pH and acetonitrile concentration of the buffer solutions.

1330 (LA-UR–94-2736) **Strain measurement by diffraction at LANSCE.** Bourke, M.A.M.; Goldstone, J.A.; Robinson, R.A. Los Alamos National Lab., NM (United States). 29 Jul 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410165–3: Neutron scattering, Sendai (Japan), 11-14 Oct 1994). Order Number DE94018264. Source: OSTI; NTIS; GPO Dep.

Residual strains affect the structural integrity of components during both fabrication and service and consequently industrial manufacturers routinely invest considerable effort in their characterization and control. Neutron diffraction has proved to be a unique technique for non-destructive strain measurement within crystalline solids. The technique is achieving recognition but is limited by lack of beam time and compromises involved in using instruments designed for powder diffraction. This paper summarizes its importance, lists the capabilities of the Los Alamos (pulsed) neutron scattering center (LANSCE) and briefly describes a concept for a dedicated instrument.

1331 (LA-UR–94-3331) **The FRAM code: Description and some comparisons with MGA.** Sampson, T.E.; Kelley, T.A. Los Alamos National Lab., NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409229–1: MGA user's workshop, Geel (Belgium), 19-20 Sep 1994). Order Number DE95001016. Source: OSTI; NTIS; INIS; GPO Dep.

The authors describe the initial development of the FRAM gamma-ray spectrometry code for analyzing plutonium isotopics, discuss its methodology, and present some comparisons with MGA on identical items. They also present some of the features of a new Windows 3.1-based version (PC/FRAM) and describe some current measurement problems. Development of the FRAM code began in about 1985, growing out of the need at the Los Alamos TA-55 Plutonium Facility for an isotopic analysis code to give accurate results for the effective specific power of heterogeneous (Am/Pu) pyrochemical residues. These residues present a difficult challenge because the americium is present mostly in a low-Z salt matrix ($AmCl_3$) with fines and small pieces of plutonium metal dispersed throughout the salt. Plutonium gamma rays suffer different attenuation than americium gamma rays of the same energy; this makes conventional analysis with a single relative efficiency function inaccurate for Am/Pu ratios and affects the analysis in other subtle ways.

1332 (OAEP–1-129) **Nondestructive neutron activation analysis of basalts.** Sangariyavanich, A.; Sriratprasit, N. Office of Atomic Energy for Peace, Bangkok (Thailand). Jan 1987. 28p. (In Thai). Order Number DE95603148. Source: OSTI; NTIS (US Sales Only); INIS.

Thirty-three samples of basalts from Kanchanaburi and Phrae have been investigated qualitatively and quantitatively. Qualitative analysis of the mineral was performed by X-ray diffraction and neutron activation techniques. The contents of 17 major, minor and trace elements were determined by non-destructive neutron activation analysis with solid state detector coupled to a multichannel analyser. Quantitative analysis of the samples agreed with the mineral identification by X-ray diffraction method. The samples could be classified into five main groups: sanidine, augite, augite and sanidine, forsterite and enstatite, and spinel.

1333 (PNL-SA–23112) **Analytical characterization of high-level mixed wastes using multiple sample preparation treatments.** King, A.G.; Baldwin, D.L.; Urie, M.W.; McKinley, S.G. Pacific Northwest Lab., Richland, WA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815–88: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017799. Source: OSTI; NTIS; INIS; GPO Dep.

The Analytical Chemistry Laboratory at the Pacific Northwest Laboratory in Richland, Washington, is actively involved in performing analytical characterization of high-level mixed waste from Hanford's single shell and double shell tank characterization programs. A full suite of analyses is typically performed on homogenized tank core samples. These analytical techniques include inductively-coupled plasma-atomic emission spectroscopy, total organic carbon methods and radiochemistry methods, as well as many others, all requiring some type of remote sample-preparation treatment to solubilize the tank sludge material for analysis. Most of these analytical methods typically use a single sample-preparation treatment, inherently providing elemental information only. To better understand and interpret tank chemistry and assist in identifying chemical compounds, selected analytical methods are performed using multiple sample-preparation treatments. The sample preparation treatments used at Pacific Northwest Laboratory for this work with high-level mixed waste include caustic fusion, acid digestion, and water leach. The type of information available by comparing results from different sample-prep treatments includes evidence for the presence of refractory compounds, acid-soluble compounds, or water-soluble compounds. Problems unique to the analysis of Hanford tank wastes are discussed. Selected results from the Hanford single shell ferrocyanide tank, 241-C-109, are presented, and the resulting conclusions are discussed.

1334 (PNL-SA–23466) **Radiochemistry methods in DOE methods for evaluating environmental and waste management samples.** Fadeff, S.K.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815–87: International nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE94017795. Source: OSTI; NTIS; INIS; GPO Dep.

Current standard sources of radiochemistry methods are often inappropriate for use in evaluating US Department of Energy environmental and waste management (DOE/EW) samples. Examples

of current sources include EPA, ASTM, Standard Methods for the Examination of Water and Wastewater and HASL-300. Applicability of these methods is limited to specific matrices (usually water), radiation levels (usually environmental levels), and analytes (limited number). Radiochemistry methods in DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods) attempt to fill the applicability gap that exists between standard methods and those needed for DOE/EM activities. The Radiochemistry chapter in DOE Methods includes an "analysis and reporting" guidance section as well as radiochemistry methods. A basis for identifying the DOE/EM radiochemistry needs is discussed. Within this needs framework, the applicability of standard methods and targeted new methods is identified. Sources of new methods (consolidated methods from DOE laboratories and submissions from individuals) and the methods review process will be discussed. The processes involved in generating consolidated methods add editing individually submitted methods will be compared. DOE Methods is a living document and continues to expand by adding various kinds of methods. Radiochemistry methods are highlighted in this paper. DOE Methods is intended to be a resource for methods applicable to DOE/EM problems. Although it is intended to support DOE, the guidance and methods are not necessarily exclusive to DOE. The document is available at no cost through the Laboratory Management Division of DOE, Office of Technology Development.

1335 (PSI–94-14) **Determination of ^{90}Sr in grass and soil.** Bajo, S. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Keil, R. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Oct 1994. 52p. Order Number DE95605571. Source: OSTI; NTIS; INIS.

A radiochemical method for the determination of ^{90}Sr in noncontaminated grass and soil is presented. The method is based on the leaching of ^{90}Sr from the mineralized samples followed by liquid-liquid extraction of ^{90}Y, its short lived daughter, by tributylphosphate and precipitation of Y-oxalate, which is counted in a low-level proportional counter. Based on dried samples of 30 g of soil and 100 g of grass the limit of detection is about 0.1 Bq/kg for both materials. (author) figs., tabs., 43 refs.

1336 (UCRL-JC–116407) **The new nuclear microprobe at Livermore.** Roberts, M.L. (Lawrence Livermore National Lab., CA (United States)); Bench, G.S.; Heikkinen, D.W.; Morse, D.H.; Bach, P.R.; Pontau, A.E. Lawrence Livermore National Lab., CA (United States). Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941010–1: 4. international conference on nuclear microprobe technology and applications, Shanghai (China), 10-14 Oct 1994). Order Number DE95002398. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Livermore National Laboratory (LLNL) and Sandia National Laboratories/California have jointly constructed a new nuclear microprobe beamline. This beamline is located on the LLNL 10 MV tandem accelerator and can be used for multidisciplinary research using PIXE, PIGE, energy loss tomography, or IBS techniques. Distinctive features of the beamline include incorporation of magnet power supplies into the accelerator control system, computer controlled object and image slits, automated target positioning to sub-micron resolution, and video optics for beam positioning and observation. Mitigation of vibrations was accomplished with vibration isolators and a rigid beamline design while integral beamline shielding was used to shield from stray magnetic fields. Available detectors include a wavelength dispersive X-ray spectrometer, a High-Purity Germanium detector (HPGe), a Lithium-Drifted Silicon X-Ray detector (SiLi), and solid state surface barrier detectors. Along with beamline performance, results from recent measurements on determination of trace impurities in an International Thermonuclear Experimental Reactor (ITER) super conducting wire strand, determination of Ca/Sr ratios in seashells, and determination of minor and trace element concentrations in sperm cells are presented.

1337 (Y–2465-3-Draft) **Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994.** Northcutt, W.G. Jr. (comp.). Oak Ridge Y-12 Plant, TN (United States). 26 May 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95001693. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the effort to downsize its uranium processing facilities, the Y-12 Plant has supported an investigation to identify extraction solvents that would both work efficiently in centrifugal contactors and be disposed of easily. Various organic ethers, hydroxy ethers, ether ketones, acids, amides, and diketones were studied for their ability to extract uranyl nitrate from aqueous solutions. Although many of these solvents were obtained commercially, others had to be synthesized in-house. The authors found a large range of extraction coefficients for these solvents. Because of steric hindrance or some other factor, certain ethers performed poorly. On the other hand, various mono- and diethers of tetrahydrofurfuryl alcohol exhibited excellent extraction and stripping coefficients for uranyl nitrate, justifying purchase of a pilot plant batch of one of this family of solvents. Likewise, the authors determined the extraction coefficient for one of the two amides synthesized in-house to be quite high.

1338 (Y/DZ–1113/R1) **Surface inspection using fourier transform infrared spectroscopy.** Powell, G.L. (Martin Marietta Energy Systems, Inc., TN (United States). Oak Ridge Y-12 Plant); Smyrl, N.R.; Williams, D.M.; Meyers, H.M. III; Barber, T.E.; Marrero-Rivera, M. Oak Ridge Y-12 Plant, TN (United States). 8 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (CONF-9408174–2: Aerospace environmental technology conference, Huntsville, AL (United States), 10-11 Aug 1994). Order Number DE95001699. Source: OSTI; NTIS; GPO Dep.

The use of reflectance Fourier transform infrared (FTIR) spectroscopy as a tool for surface inspection is described. Laboratory instruments and portable instruments can support remote sensing probes that can map chemical contaminants on surfaces. Detection limits under the best of conditions are in the subnanometer range (i.e., near absolute cleanliness), excellent performance is obtained in the submicrometer range, and useful performance may exist for films tens of microns thick. Identifying and quantifying contamination such as mineral oils and greases, vegetable oils, and silicone oils on aluminum foil, galvanized sheet steel, smooth aluminum tubing, and gritblasted 7075 aluminum alloy and D6AC steel are described. The ability to map in time and space the distribution of oil stains on metals is demonstrated. Techniques for quantitatively applying oils to metals, subsequently verifying the application, and nonlinear relationships between reflectance and the quantity of oil are discussed.

4002 Inorganic, Organic, and Physical Chemistry

Refer also to citation(s) 65, 282, 287, 631, 632, 887, 1170, 1180, 1290, 1375, 1382, 1385, 1386, 1387, 1388, 1688, 2294, 2538

1339 (AREAEE–306) **Electrochemical recovery of iron from iron and steel pickling wastes.** Elmasry, M.A.A.; Elsayed, A.A. Nuclear Research Centre, Inshas (Egypt). 1988. 34p. Order Number DE95605635. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents a study to the problem of treatment and disposal of iron and steel pickling wastes with emphasis directed towards electrochemical regeneration methods. Types of electrochemical cells, their design, separation factor, cost and power consumption associated with various types of cells are also discussed. The report also deals with an experimental investigation on the applicability of porous fixed bed graphite electrode for the removal of iron by cathodic deposition from ferrous ions containing solutions. Iron removal efficiency, current efficiency, and limiting current were investigated and correlated to the feed solution concentration cost of pickling liquors temperature and p^H. The anticipated cost of pickling liquors treatment using the present experimental set up was discussed and related to those reported in the literature. 11 fig., 3 tab.

1340 (BNL–60952) **Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001).** Kuhn, M.; Rodriguez, J.A. Brookhaven National Lab., Upton, NY (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941001–4: 41. annual American Vacuum Society symposium,

Denver, CO (United States), 24-28 Oct 1994). Order Number DE95001994. Source: OSTI; NTIS; GPO Dep.

It has been found that by making specific bimetallic systems (in this case a noble metal deposited on a transition metal surface) one can change the catalytic activity and selectivity of the metals for reactions that lead to the conversion of hydrocarbons. A major problem associated with these catalysts is sulfur poisoning. The interaction of sulfur and copper on Pt(111) and Ru(001) has been examined using X-ray photoelectron spectroscopy (XPS) and thermal desorption mass spectroscopy (TDS). Cu/Pt (111) and Cu/Ru(001) surfaces were exposed to S_2 gas at 300 K. It was found that for both substrates stable copper-sulfide films were formed, of which the Cu-S/Ru(001) system was the more stable. The decomposition of the Cu_2S films on Pt(111) occurred at 600–850 K and on Ru(001) at 900–1,000 K. Breakdown of the films led to evolution into the gas phase of sulfur (mainly as S_2) without desorption of copper or the sulfur chemisorbed on the substrate. This chemisorbed sulfur desorbed in a broad feature from 1,000–1,500 K. For the Ru(001) substrate the Cu atoms remained on the surface until they desorbed at 1080 K, while on Pt(111) the Cu atoms migrated into the Pt(111) surface to form a subsurface Cu-Pt alloy and no Cu desorption features were seen at temperatures as high as 1,300 K. On Pt(111), copper-sulfide promoted the formation of a bulk-like platinum sulfide. No sulfidation of ruthenium was detected in the presence of copper-sulfide films. For both substrates the sulfur atoms were found to highly perturb the copper sites, decreasing the ability of the noble-metal ad atoms to adsorb CO.

1341 (DOE/ER/13773–5) **[Model catalyst studies of active sites and metal-support interactions on vanadia and vanadia-supported catalysts].** Yale Univ., New Haven, CT (United States). [1990]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13773. Order Number DE95002203. Source: OSTI; NTIS; GPO Dep.

The report is divided into the following: HREELS studies of adsorption on Rh/TiO_2 model catalysts; photoemission studies of the Rh/TiO_2 interaction; V-O-Ti interactions in supported vanadia catalysts; and surface physics and chemistry of vanadium oxides.

1342 (DOE/ER/13773–6) **[Model catalyst studies of active sites and meta L support interactions on vanadia and vanadia-supported catalysts].** Yale Univ., New Haven, CT (United States). [1991]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER13773. Order Number DE95002204. Source: OSTI; NTIS; GPO Dep.

We have performed a resonant photoemission study on both stoichiometric and defect TiO_2 (110) surfaces using synchrotron radiation. A resonant enhancement of the O(2p) valence band photoemission intensity is observed for both nearly Perfect and reduced TiO_2 surfaces as the photon energy is swept through the Ti $3p \geq 3d$ optical transition energy, which indicates a strong hybridization between the O and Ti ions. Changes in the shape of the O(2p) band are also observed. As compared to the nearly perfect surface, the reduced surface has higher emission intensity from the bonding orbitals relative to the nonbonding orbitals. In addition, the intensity of emission from the O(2p) bonding orbitals resonates more than that from the O(2p) nonbonding orbitals for both nearly perfect and reduced surfaces. The resonant enhancement for the O(2p) bonding orbitals is consistent with theoretical calculations, which predict that the O(2p)-Ti(3d) hybridization involves primarily those O(2p) orbitals; the origin and energy dependence of the resonant enhancement for the O(2p) nonbonding orbitals are not understood. The spectra for the defect surface exhibit a resonant change in the intensity of the Ti(3d) emission as well, which is similar to those reported for Ti_2O_3, $SrTiO_{3-x}$ and Ti metal.

1343 (DOE/ER/14114–4) **Chemical interactions between protein molecules and polymer membrane materials: Annual progress report, February 1, 1994–October 31, 1994.** Koehler, J.A.; Belfort, G. Rensselaer Polytechnic Inst., Troy, NY (United States). 25 Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14114. Order Number DE95001808. Source: OSTI; NTIS; GPO Dep.

During the past year, the authors have used the Surface Forces Apparatus (SFA) to measure the intermolecular forces between a model protein (hen egg-white lysozyme) and a model hydrophilic surface (mica), between lysozyme and itself and between lysozyme and a model hydrophobic surface composed of a crosslinked alkoxysilane surfactant (hexadecyltriethoxysilane, HTE). As expected, repulsive forces are dominant between the hydrophilic surfaces with the same charge (lysozyme-lysozyme) while attractive forces are dominant between oppositely charged surfaces (lysozyme-mica) and between the lysozyme and the hydrophobic surface. The DLVO theory for charged surfaces was found to agree with the results of the lysozyme-lysozyme interaction. Efforts also have been focused on trying to create a well-formed, defect-free monolayer of the HTE on the surface of the mica using a Langmuir-Blodgett (LB) apparatus. A smooth, defect-free surface is desired for the intermolecular force studies. Atomic force microscopy has been used to determine the topography of the HTE films.

1344 (DOE/ER/14225–3) **Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994.** Valentini, J.J. Columbia Univ., New York, NY (United States). Dept. of Chemistry. [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER14225. Order Number DE95002943. Source: OSTI; NTIS; GPO Dep.

The work reported here was done during the period September 9, 1991 through April 14, 1994. During this 2 $\frac{1}{2}$-year period this work has been focused on three related efforts: (1) experimental studies of the state-to-state dynamics of the $H + RH \rightarrow H_2 + R$ reactions, where RH is CH_4, C_2H_6, C_3H_8, and $CHCl_3$, (2) theoretical studies of the $H + CH_4 \rightarrow H_2 + CH_3$ reaction, and (3) the development of a single-mode purely pulsed dye laser for Doppler-resolved coherent anti-Stokes Raman scattering (CARS) spectroscopy. A report of the progress the authors have made in each of these efforts is given.

1345 (DOE/ER/14258–2) **Cluster reactions: An approach to understanding the fundamentals of heterogeneous catalysis.** Castleman, A.W. Jr. Pennsylvania State Univ., University Park, PA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER14258. Order Number DE95002947. Source: OSTI; NTIS; GPO Dep.

The physical basis for catalysis is not well understood and the motivation for this ongoing research is to provide a basis for unraveling the role which composition, morphology and electronic states have on the functioning of catalysts for various classes of reactions. The work during the first two and one-half year grant period has focused on unsupported clusters of selected composition, charge state, and size. Research has proceeded along three general lines of inquiry: (1) investigation of the reactivity of these cluster materials and determination of the influence of their charged state; (2) determination of the kinetics of association (adsorption) of various reactants and unraveling the mechanisms of certain oxidation reactions known to be catalyzed on metal cluster alloys, oxides and carbides, and (3) thermochemical measurement of the absorption of gaseous species onto alloy and metal oxide and carbide cluster systems. The authors have pursued the role of metal and metal-oxide clusters, and the charge states of these, as they function to influence the reactions of adsorbed species including ammonia, alcohols, water, NO_x, as well as CO and hydrogen. Evidence has been obtained that small positively charged nickel clusters function to catalyze reactions between adsorbed CO and hydrogen. In supportive studies, they have investigated the clustering of ammonia, methanol and water to nickel clusters of varying size. These studies, in conjunction with density functional calculations which are in progress, provide insight into cluster structures and knowledge of adsorption energies.

1346 (ETDE/DE-mf–95716319) **Formation and degradation mechanisms of polychlorodibenzodioxins, polychlorodibenzofurans and other organic pollutants produced in waste incineration processes: Final report.** Stieglitz, L.; Vogg, H. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Wasser-Abfall-Boden (PWAB). [1992]. 23p. (In German). Contract PWAB PD 85 001. Order Number DE95716319. Source: OSTI; NTIS (US Sales Only).

In waste incineration processes, polychlorinated dibenzodioxins (PCDD) and furans (PCDF) are produced mainly in gas/solid reactions on the fly ash at an average temperature of 300 C. Carbon concentrations in the fly ash should therefore be kept low, and depositions of fly ash in the low-temperature range should be avoided. (UT)

1347 (IC–94/149) **Structural and thermodynamic properties of 3-d transition metals: Pseudopotential theory revisited.** Osman, S.M. (International Centre for Theoretical Physics, Trieste (Italy)); Mujibur Rahman, S.M. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 13p. Order Number DE95605639. Source: OSTI; NTIS (US Sales Only); INIS.

Structural and thermodynamic properties of 3d-transition metals are calculated in terms of the pseudopotential theory. The s-p and d-electrons are treated in a pseudoadiabatic approximation in such a way so that the s-p and d-electron are treated separately under the same footing. The s-p electrons are treated in terms of the conventional second-order pseudopotential theory, while the tightly bound d-electrons are treated in terms of the Wills-Harrison prescription that makes use of the Fridel rectangular electron-density of states (DOS) model. The predictions of the structural phase stability and other relevant thermodynamic properties are found to be consistent with experiments for almost all of the metals. (author). 16 refs, 5 tabs.

1348 (IC–94/196) **Numerical solution of the optimized random phase approximation.** Pastore, G. (Trieste Univ. (Italy). Ist. di Fisica Teorica); Matthews, F.; Akinlade, O.; Badirkhan, Z. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 14p. Order Number DE95605636. Source: OSTI; NTIS (US Sales Only); INIS.

An accurate, efficient and robust numerical method for the solution of the Optimized Random Phase Approximation (ORPA) of classical liquids is presented. The uniqueness of the solution of the ORPA is rigorously proved. The method, hinging on the characterization of the generating functions, significantly improves on previous algorithms. Higher accuracy is obtained by using the values of the unknown functions on the grid points as independent variables instead of the usual coefficients of an expansion in orthogonal polynomials. It is shown that minimizing a suitably modified functional with a conjugate-gradient algorithm results in a very efficient and robust algorithm. (author). 23 refs, 1 fig., 1 tab.

1349 (INIS-mf–14386, pp. WP55) **Ab initio Hartree-Fock study of the B/Si(001) 2 x 1 adsorption system.** Radny, M.W. (Newcastle Univ., NSW (Australia). Dept. of Physics); Smith, P.V. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. CHEMISORPTION/hartree-fock method; SILICON/surface treatments; SILICON/topology; BORON; CHEMISORPTION; DIMERS; SILICON; TOPOLOGY

1350 (INIS-mf–14387, [pp. 1]) **EPR in fullerenes.** Stankowski, J. (Polska Akademia Nauk, Poznan (Poland). Inst. Fizyki Molekularnej). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. ELECTRON SPIN RESONANCE/fullerenes; FULLERENES; RADICALS

1351 (INIS-mf–14387, [pp. 1]) **Anisotropic quantum spin fluid and anisotropic quantum spin glass formation in La-cuprate-based catalysts for phenol oxidation.** Oliva, C. (Metal Lux, Milan (Italy). Centro Ricerche Pellicole Scottili); Forni, L.; Termignone, G.; Vishniakov, A.V.; Mukovozov, I.E. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 3 refs. CATALYSTS/cuprates; ELECTRON SPIN RESONANCE/catalysts; ELECTRON SPIN RESONANCE/oxidation; ELECTRON SPIN RESONANCE/phenol; ANISOTROPY; CATALYSTS; CUPRATES; OXIDATION; PHENOL; EUROPIUM; LANTHANUM

1352 (INIS-mf–14387, [pp. 1]) **EPR investigations of iminoxy free radicals and paramagnetic metal-oxime systems.** Chmielewski, P.J. (Wroclaw Univ. (Poland). Inst. Chemii); Sienkiewicz, J.; Siatecki, Z.; Jezierski, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 5 refs. ORGANIC NITROGEN COMPOUNDS/irradiation; RADICALS/electron spin resonance; TRANSITION ELEMENT COMPLEXES/irradiation; IRRADIATION; OXIMES; RADIATION EFFECTS; RADICALS

1353 (INIS-mf–14387, [pp. 1]) **Electron spin-echo studies of spin-spin relaxation processes.** Hoffmann, S.K. (Polska Akademia Nauk, Poznan (Poland). Inst. Fizyki Molekularnej). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 2 figs. SPIN ECHO/spin-spin relaxation; COPPER IONS; SELENIUM COMPOUNDS

1354 (INIS-mf–14387, [pp. 1]) **Influence of hydration of selected gadolinium β-diketonates on their EPR spectra.** Szyczewski, A. (Uniwersytet Adama Mickiewicza, Poznan (Poland). Inst. Fizyki); Krzyminiewski, R.; Pietrzak, J.; Lis, S.; Elbanowski, H. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 1 ref. GADOLINIUM COMPLEXES/electron spin resonance; GADOLINIUM COMPLEXES/hydration; HYDRATION

1355 (INIS-mf–14387, [pp. 1]) **EPR of a nitroxide adsorbed on SiO_2 and La_2O_3.** Chasov, V.V. (Nauchno-Issledovatel'skij Fiziko-Khimicheskij Inst., Moscow (Russian Federation)); Shvets, V.A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 1 ref. LANTHANUM OXIDES/adsorption; LANTHANUM OXIDES/organic nitrogen compounds; ELECTRON SPIN RESONANCE; ADSORPTION; SILICON OXIDES

1356 (INIS-mf–14387, [pp. 1]) **The ESR-spectroelectrochemical detection of organometallic W(+1) complex compounds.** Wilgocki, M. (Wroclaw Univ. (Poland). Inst. Chemii); Szymanska-Buzar, T.; Jaroszewski, M.; Ziolkowski, J.J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 1 ref., 2 figs. TUNGSTEN COMPLEXES/electron spin resonance; TUNGSTEN COMPLEXES/polarography; ORGANOMETALLIC COMPOUNDS; TEMPERATURE RANGE 0065-0273 K; POLAROGRAPHY

1357 (INIS-mf–14387, [pp. 1]) **Interaction of vanadium pentoxide with H-ZSM-5 zeolite investigated by EPR.** Strugaru, D. (University, Cluj-Napoca, (Romania). Faculty of Physics); Trif, E.; Cristea, V.; Russu, R. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane

(Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 2 refs. VANADIUM OXIDES/electron spin resonance; VANADIUM OXIDES/zeolites; ADSORPTION; SURFACE PROPERTIES; TEMPERATURE RANGE 0273-0400 K; TEMPERATURE RANGE 0400-1000 K; TEMPERATURE RANGE 1000-4000 K; ZEOLITES

1358 (INIS-mf–14393, pp. 45-46) **Determination of hydrate numbers from solubility data.** Mioduski, T. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs. SCANDIUM SULFATES/hydration; HYDRATION; SOLUBILITY; THERMODYNAMIC PROPERTIES

1359 (INIS-mf–14393, pp. 46-47) **Covalency of scandium(III) as manifested in the enthalpies of solution of anhydrous rare earth halides.** Mioduski, T. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs. RARE EARTHS/solution heat; SCANDIUM IONS/covalence; SCANDIUM IONS/solution heat; HALIDES; COVALENCE

1360 (INIS-mf–14393, pp. 79-80) **A facility with induction furnace for boron nitride production.** Nowicki, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Szczepankiewicz, C. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs. BORON NITRIDES/induction furnaces; LABELLED COMPOUNDS/gallium alloys; LABORATORY EQUIPMENT

1361 (INIS-mf–14393, pp. 80-81) **Investigation of structures and properties of new materials from amino triazole complexes of transition metals.** Lukasiewicz, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Walis, L.; Michalik, J.; Sadlo, J.; Wasowicz, T. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs., 1 fig. YTTRIUM COMPLEXES/electron spin resonance; YTTRIUM COMPLEXES/solid clusters; YTTRIUM COMPLEXES/structural chemical analysis; AMINES; METALS; SPECTROPHOTOMETRY; TRIAZOLES

1362 (INIS-mf–15064) **Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report.** Iske, U.; Bullmann, M.; Jechorek, M.; Scheibe, P. Institut fuer Biotechnologie, Leipzig (Germany). 31 Dec 1991. 21p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0319738A. Order Number DE95716302. Source: OSTI; NTIS (US Sales Only); INIS.

Fundamental investigations into the biosorption of environmentally relevant heavy metals were carried out with different microbial adsorbents, and processes were proposed for industrial effluents. In order to improve the technology of biosorption processes, attempts were made to improve the sorption efficiency of biological sorbents, and investigations were carried out on the immobilisation of biological adsorbents. (orig.)

1363 (IS-T–1698) **Dynamic NMR studies of restricted arene rotation in the chromiu tricarbonyl thiophene and selenophene complexes.** Sanger, M.J. Ames Lab., IA (United States). 27 May 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001656. Source: OSTI; NTIS; GPO Dep.

This thesis contains the results of organometallic studies of thiophene and selenophene coordination in transition metal complexes. Chromium tricarbonyl complexes of thiophene, selenophene, and their alkyl-substituted derivatives were prepared and variable-temperature ^{13}C NMR spectra of these complexes were recorded in dimethyl ether. Bandshape analyses of these spectra yielded activation parameters for restricted rotation of the thiophene and selenophene ligands in these complexes. Extended Hueckel molecular orbital calculations (EHMO) of the free thiophene and selenophene ligands and selected chromium tricarbonyl thiophene complexes were performed to better explain the activation barriers of these complexes. The structure of $Cr(CO)_3(\eta^5$-2,5-dimethylthiophene) was established by a single crystal X-ray diffraction study.

1364 (IS-T–1699) **Selenophene transition metal complexes.** White, C.J. Iowa State Univ. of Science and Technology, Ames, IA (United States). 27 Jul 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001675. Source: OSTI; NTIS; GPO Dep.

This research shows that selenophene transition metal complexes have a chemistry that is similar to their thiophene analogs. Selenophene coordination has been demonstrated and confirmed by molecular structure in both the η^5- and the η^1(Se)-coordination modes. The reaction chemistry of selenophene complexes closely resembles that of the analogous thiophene complexes. One major difference, however, is that selenophene is a better donor ligand than thiophene making the selenophene complexes more stable than the corresponding thiophene complexes. The ^{77}Se NMR chemical shift values for selenophene complexes fall within distinct regions primarily depending on the coordination mode of the selenophene ligand. In the final paper, the C-H bond activation of η^1(S)-bound thiophenes, η^1(S)-benzothiophene and η^1(Se)-bound selenophenes has been demonstrated. The deprotonation and rearrangement of the η^1(E)-bound ligand to the carbon bound L-yl complex readily occurs in the presence of base. Reprotonation with a strong acid gives a carbene complex that is unreactive towards nucleophilic attack at the carbene carbon and is stable towards exposure to air. The molecular structure of $[Cp(NO)(PPh_3)Re(2$-benzothioenylcarbene)$]O_3SCF_3$ was determined and contains a Re-C bond with substantial double bond character. Methyl substitution for the thienylcarbene or selenylcarbene gives a carbene that rearranges thermally to give back the η^1(E)-bound complex. Based on these model reactions, a new mechanism for the H/D exchange of thiophene over the hydrodesulfurization catalyst has been proposed.

1365 (LBL–35769) **Chemical sciences, annual report 1993.** Lawrence Berkeley Lab., CA (United States). Oct 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002655. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Sciences Division (CSD) is one of eleven research Divisions of the Lawrence Berkeley Laboratory, a DOE National Laboratory. In FY 1993, the Division made considerable progress on developing two end-stations and a beamline to advance combustion dynamics at the Advanced Light Source (ALS). In support of DOE's national role in combustion research and chemical science, the beamline effort will enable researchers from around the world to make fundamental advances in understanding the structure and reactivity of critical reaction intermediates and transients, and in understanding the dynamics of elementary chemical reactions. The Division has continued to place a strong emphasis on full compliance with environmental health and safety guidelines and regulations and has made progress in technology transfer to industry. Finally, the Division has begun a new program in advanced battery research and development that should help strengthen industrial competitiveness both at home and abroad.

1366 (LBL–36065) **Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy.** McIntyre, B.J. Lawrence Berkeley Lab., CA (United States). May 1994. 229p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002346. Source: OSTI; NTIS; GPO Dep.

Results of this thesis show that STM measurements can provide information about the surfaces and their adsorbates. Stability of

Pt(110) under high pressures of H2, O2, and CO was studied (Chap. 4). In situ UHV and high vacuum experiments were carried out for sulfur on Pt(111) (Chap.5). STM studies of CO/S/Pt(111) in high CO pressures showed that the Pt substrate undergoes a stacking-fault-domain reconstruction involving periodic transitions from fcc to hcp stacking of top-layer atoms (Chap.6). In Chap.7, the stability of propylene on Pt(111) and the decomposition products were studied in situ with the HPSTM. Finally, in Chap.8, results are presented which show how the Pt tip of the HPSTM was used to locally rehydrogenate and oxidize carbonaceous clusters deposited on the Pt(111) surface; the Pt tip acted as a catalyst after activation by short voltage pulses.

1367 (ORNL–6829) **A visual cell for measuring the solubility of prograde soluble salts in water at high temperatures and pressures.** Moore, R.C.; Simonson, J.M.; Mesmer, R.E. Oak Ridge National Lab., TN (United States). Oct 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002058. Source: OSTI; NTIS; GPO Dep.

An apparatus has been constructed for measuring the solubility of prograde soluble salts in water at high temperatures and pressures. The apparatus consists of a visually accessible cell thermostated in a rocking furnace. The apparatus allows for rapid, accurate solubility measurements for temperatures over 650 K and pressures up to 170 bars. The cell was constructed of platinum with sapphire windows and gold seals for corrosion resistance. A 3x telescope is used to observe the phase change in the cell. A key feature of the cell is the ability to control the system pressure. A section of small bore platinum tubing is used to connect the cell to an external pressure source. The tubing can remain open to the pressure source or be sealed off during a measurement. To minimize equilibration times, the entire apparatus was mounted to a rocking frame which can operate in the horizontal or vertical position. The apparatus was tested by measuring the solubility of NaCl in water at temperatures between 345 and 516 K at saturation pressure. Results are in good agreement with existing literature values.

1368 (PPPL-CFP–3140) **Toxic Chemical System (TCS).** Del Gandio, P. Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (CONF-941113–1: Conference on development and application of computer techniques to environmental studies: Envirosoft '94, San Francisco, CA (United States), 16-18 Nov 1994). Order Number DE94018446. Source: OSTI; NTIS; GPO Dep.

The Toxic Chemical System (TCS) will have the capacity to process chemical data, calculate chemical formulas, and format the data into the United States (US) Environmental Protection Agency (EPA) Toxic Chemical Release Inventory Reporting Form R of Section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA), hereafter be referred to as "Form R." The filing of this form is required of all industries which manufacture, process or otherwise use any EPA listed chemicals in quantities in excess of their threshold planning quantities (TPQ). Facilities required to file the Form R must report the quantities of both routine and accidental releases of listed toxic chemicals on-site during the calendar year and the amount contained in waste products transferred off-site. This paper describes a specialized computer system designed for regulatory compliance.

1369 (TVA/NFERC–94/1) **Toxicity and physical properties of atrazine and its degradation products: A literature survey.** Pugh, K.C. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 29p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (BULLETIN/Y–235). Order Number DE95001584. Source: OSTI; NTIS.

The Tennessee Valley Authority's Environmental Research Center has been developing a means of detoxifying atrazine waste waters using TiO_2 photocatalysis. The toxicity and physical properties of atrazine and its degradation products will probably be required information in obtaining permits from the United States Environmental Protection Agency for the demonstration of any photocatalytic treatment of atrazine waste waters. The following report is a literature survey of the toxicological and physical properties of atrazine and its degradation products.

4004 Electrochemistry

Refer also to citation(s) 887, 1166, 1365

1370 (IS-T–1713) **Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes.** Feng, Jianren. Iowa State Univ. of Science and Technology, Ames, IA (United States). 1994. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001653. Source: OSTI; NTIS; GPO Dep.

The research illustrated in this thesis was performed under the guidance of Professor Dennis C. Johnson beginning in March 1987. Chapter 2 concentrates on the development and electrocatalytic properties of iron-doped β-PbO_2 films on noble-metal substrates. Chapter 3 focuses attention on the preparation and characterization of iron-doped β-PbO_2 films on titanium substrates (Fe-PbO_2/Ti). Chapter 4 discusses anodic evolution of ozone at Fe-PbO_2/Ti electrodes. Chapter 5 describes electrochemical incineration of p-benzoquinone (BQ) at Fe-PbO_2/Ti electrodes. In addition, the Appendix includes another published paper which is a detailed study of α-PbO_2 films deposited on various types of stainless steel substrates.

4005 Photochemistry

Refer also to citation(s) 2296

1371 (CONF-930802–18) **Photocatalytic degradation of atrazine using TiO_2-impregnated mesh.** Kiserow, D.J.; Pugh, K.C. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 26p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–339). From 206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993. Order Number DE95001725. Source: OSTI; NTIS.

TiO_2 photocatalysis is investigated is a potential means for the disposal of pesticide rinsate waste at agrochemical dealerships. The focus is an evaluation of parameters that affect the rate and mechanism of atrazine degradation using formulated atrazine (ca. 20-25 ppm), TiO_2 mesh, a high-pressure mercury-vapor lamp, and solar irradiation. The UV transmission of a variety of transparent materials was measured and atrazine photocatalysis was carried out using several materials as reactor covers. The pseudo-first-order rate constants were calculated and compared to determine which cover results in the most efficient atrazine degradation. A clear acrylic gave results nearly identical to Pyrex and was chosen for future photocatalytic experiments. UV intensity and photocatalytic rate were studied as a function of different numbers of layers of TiO_2 mesh. It was found that five layers give the optimum rate of degradation without employing excess mesh. In order to assess the general effect of impurities present in water on the rate of atrazine degradation, water from five different sources was obtained and each sample was analyzed for purity and used to prepare aqueous atrazine for photocatalytic degradation. The results show that contaminants specific to different locations are likely to inhibit the rate of photocatalysis to different degrees. While working to maximize the rate of atrazine degradation, studies are concurrently in progress to elucidate the mechanism of degradation for the experimental conditions employed herein. Initial results indicate that the overall degradation of atrazine to the reported end product, cyanuric acid, occurs by two distinct pathways of similar importance.

1372 (CONF-9309146–10) **Photocatalytic destruction of atrazine using TiO_2 mesh.** Pugh, K.C.; Kiserow, D.J.; Sullivan, J.M.; Grinstead, J.H. Jr. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 36p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–343). From 5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management; Atlanta, GA (United States); 27-29 Sep 1993. Order Number DE95001731. Source: OSTI; NTIS.

The optimization of a technology for the TiO_2-mediated solar photocatalysis of atrazine is described. The target users of this technology might be agrochemical dealers, manufacturers, and possibly farmers. Studies were performed to determine the ideal cover material for such a reactor based on UV light transmitting

properties. The best cover material was a UV transmitting acrylic. The TiO_2 employed for this technology was bound to fiberglass mesh. The effects of mesh amount, stirring, water impurities, concentration of pesticide, and source of UV light (mercury vapor lamp vs. solar) were also determined. The most efficient photocatalysis was achieved using five layers of mesh, a stirred reaction, water low in carbonate and other ions, a dilute waste stream, and solar irradiation rather than a mercury-vapor lamp. The formation and disappearance of eight intermediates were followed in a 2429 h indoor experiment comparing pure and formulated atrazine. A modified reaction mechanism was proposed based on studies of the detected intermediates.

1373 (DOE/ER/00038–3707) **Photoinduced charge transfer between fullerenes and TiO_2 semiconductor colloids.** Kamat, P.V. (Univ. of Notre Dame, IN (United States). Radiation Lab.); Bedja, I.; Hotchandani, S. Notre Dame Univ., IN (United States). Radiation Lab. [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76ER00038. (CONF-940529–26: 185. Electrochemical Society meeting, San Francisco, CA (United States), 22-27 May 1994). Order Number DE95001447. Source: OSTI; NTIS; GPO Dep.

A photocatalytic method has been presented to carry out one-electron reduction of C_{60} and C_{70} in 50/50 (v/v) benzene/ethanol. The fullerene reduction was carried out in colloidal TiO_2 suspension using UV excitation. The charge transfer between the excited TiO_2 semiconductor colloid and fullerene molecule occurs with a quantum efficiency of 13% for C_{70} and 24% for C_{60}. Laser flash photolysis measurements have been carried out to elucidate the mechanism of photocatalytic reduction.

1374 (DOE/ER/13633–12) **Excited state processes in transition metal complexes. Redox splitting in soluble polymers: Progress report, July 15, 1993–July 14, 1994.** Meyer, T.J. North Carolina Univ., Chapel Hill, NC (United States). Jul 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-86ER13633. Order Number DE95002690. Source: OSTI; NTIS; GPO Dep.

In the past grant period, this DOE supported work has progressed considerably in the rational design of polypyridyl complexes of ruthenium(II), osmium(II), and rhenium(I) that exhibit predetermined photochemical, photophysical, and redox properties. The exploration of molecular design has moved forward along four fronts. The author's have developed a synthetic strategy for the preparation of heteroleptic complexes based on ruthenium(II) that contain three different bidentate ligands. Second, the authors are utilizing this synthetic procedure to prepare complexes with broad band absorbance throughout the UV and visible regions of the spectrum, so called "black absorbers." Third, the authors have utilized more traditional synthetic procedures to prepare an extended series of nitro and nitrosyl containing complexes that could provide the basis for emission-based pH determination. Fourth, the controlled immobilization of the d^6 chromophores on soluble styrenic polymers is under investigation in an attempt to study long range electron and energy transfer. Additionally, the authors have established protocols for the elucidation of excited state dynamics by utilizing time-resolved resonance Raman and transient infrared spectroscopies, as well as emission spectral fitting techniques. These studies have lead to the publication or submission of nine manuscripts during the budget period.

1375 (DOE/ER/14104–5) **Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies.** Osgood, R.M. Jr.; Yang, Q. Columbia Univ., New York, NY (United States). Columbia Radiation Lab. Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14104. Order Number DE95002944. Source: OSTI; NTIS; GPO Dep.

Enhancement in carrier lifetime has made semiconductors of interest for applications in photocatalysis ranging from solar energy conversion to environmental remediation. The authors have focused recent experimental work on adsorbed methyl halide molecules (CH_3X, X = Br, Cl, I) on GaAs(110). They have identified and observed for the first time several chemical processes which control photochemistry on semiconductor surfaces. During this last year, the authors have focused on relating the observed electron transfer processes to the structure of the adsorbate molecular layer. To accomplish this, they have had to expand the experimental work with new measurement techniques. The primary focus of the work has been in determining the orientation of the adsorbates with regard to the underlying surface correlation. An important result of this work has been that the authors have provided for the first time an unequivocal determination of the orientation of physisorbed molecules on semiconductor surfaces. In addition, the work has suggested that photostimulated desorption of energetic neutrals can provide a useful technique for determining adsorbate molecular orientation. The primary experimental technique has involved dynamic studies employing angle-resolved time-of-flight (TOF) mass spectrometry in concert with tunable laser excitation sources, to obtain information regarding the kinetic energy and angular distribution of reaction products.

1376 (DOE/ER/45476–T1) **Photophysical processes on triplet states and radical ions in pure and molecularly doped polymers.** Burkhart, R.D. Nevada Univ., Reno, NV (United States). Dept. of Chemistry. 20 May 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-92ER45476. Order Number DE95002681. Source: OSTI; NTIS; GPO Dep.

Given here is a brief summary of those products which have or will shortly result in a publication. The photophysics of phenyldibenzophosphole in fluid solution has been studied and evidence for triplet excimers is presented. Time resolved transient absorption spectroscopy of triplet excimers and radical ions produced by laser photoexcitation of phenyldibenzophosphole in N,N-dimethylformamide has been performed. The photophysics of phenyldibenzophosphole and dibromocarbazole in polymers have been studied.

4006 Radiation Chemistry

Refer also to citation(s) 410, 591, 1352

1377 (AREAEE–315) **Extraction of U, Th and gross gamma fission products by irradiated (HTTA-TBP) mixtures.** Souka, N.; Ramadan, A.; Abdelrehim, F.; Mahmoud, M. Nuclear Research Centre, Inshas (Egypt). 1992. 26p. Order Number DE95605727. Source: OSTI; NTIS (US Sales Only); INIS.

This work is an investigation of the extraction behaviour of uranium, thorium and gross gamma fission products by a mixture of thenoyl tri fluoro acetone and tri n-n-butyl phosphate. The experiments were carried out from nitric acid solutions using simulated irradiated ETRR-1 fuel solutions. The study included investigations of : effect of hydrogen ion concentration, effect of TTA concentration, effect of TBP concentration, effect of uranium concentration and finally the effect of absorbed dose on the extraction characteristics of the synergic mixture. Separation factors were calculated and the effect of absorbed dose on the loading capacity of the organic phase was estimated. 4 tab., 6 fig.

1378 (INIS-JP–024, pp. B710/1-B710/6) **BEAM applications to polymer materials.** Tagawa, Seiichi (Osaka Univ., Ibaraki (Japan). Inst. of Scientific and Industrial Research). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Recently papers about beam applications to polymers have been increasing rapidly both in the fundamental and applied fields. Fairly large number of papers have been published in the fundamental aspects of radiation effects of beam applications to polymers such as pulse radiolysis and high density electronic excitation effects. A number of papers have been published in the more applied aspects of beam applications to polymers such as radiation processing and curing. The present paper describes recent beam applications to polymers. 1. Radiation Effects on Polymers; Radiation effects on polymers have been studied for more than 40 years.

Most of work on radiation effects on polymers has been carried out by using high energy photon (gamma-ray) and electron beams, since polymers are sensitive to any kinds of ionizing radiation. Even non-ionizing radiation such as ultraviolet and visible light excites electronic excited states of polymers and then photo-chemical reactions of polymers are induced from the electronic excited states. Studies on radiation effects of other ionizing radiation on polymers have not been so popular for a long time. Recently application of new radiation such as ion beams to polymers have been worthy of remark in fields of advanced science and technology, since new radiation beams induce different radiation effects from those induced by high energy gamma-rays and electrons. 2. Beam Applications of Polymers; Recent progress in beam applications to polymers such as radiation processing and curing, x-ray and electron beam microlithography, and applications of new beams such as ion beams to polymers has been reviewed. (author).

1379 (INIS-mf–14319) **A study of using polythiol compounds and 2-ethyl-hexyl-acrylate with carbon tetrachloride as sensitizers for radiation vulcanization of natural rubber latex.** Polsuksiri, C. Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology. 1989. 147p. (In Thai). Order Number DE95603356. Source: OSTI; NTIS (US Sales Only); INIS.

Experiments on using 3 different compounds of polythiol and an acrylate as sensitizer for radiation vulcanization were conducted. It was found that 1,4 butane diol propane tris-3-mercapto propionate showed the tendency to be a good sensitizer. The tensile strength of the rubber film prepared from the irradiated latex was found to be 14 MPa at sensitizer concentration of 1 phr and radiation dose of 45 kGy. As for 2-ethyl hexyl acrylate (2EHA), the maximum tensile strength of rubber film was found to be 23 MPa at concentration of 3 phr and radiation dose of 35 kGy. The mixture of 2 EHA and CCl_4 at various ratio was also used as sensitizer. The optimum ratio was found to be 5:1 at concentration of 6 phr and radiation dose of 15 kGy. The maximum tensile strength was as high as 25 MPa. The study also revealed that the radiation vulcanized latex with crosslink density of about $18x10^{18}$ C.L./cm^3 would give the rubber film of highest tensile strength.

1380 (INIS-mf–14340) **Proceedings of the 3. nuclear science and technology conference.** Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In English, Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Non-power applications of nuclear technology in medicine, agriculture and industry are discussed. These applications include irradiation of food for desinfestation; tracer techniques used in diagnosis and therapy and radiation chemistry important to industrial processes. Some technologies which evolved from the development of the nuclear power industry are also discussed.

1381 (INIS-mf–14365) **The effect of proteins on the aging properties of radiation vulcanized natural rubber latex.** Abad, L.V. (Univ. of Santo Tomas, Manila (Philippines)). Santo Tomas Univ. Hospital, Manila (Philippines). 1993. 172p. Order Number DE95603357. Source: OSTI; NTIS (US Sales Only); INIS.

Also available at PNRI library.

The effect of natural rubber latex (NRL) proteins on the aging properties of NRL films was investigated. SDS-PAGE electrophoresis of the rubber proteins in NRL (Sri-Lanka) indicated a total of 18 proteins. A sharp decrease in tensile strength was observed after aging when NRL films were leached in 1% NH_4OH. However, when these films were soaked in ethanol prior to leaching, the aging properties approximated those of the unleashed samples. Electrophoretic analysis of the proteins present in the NH_3 extracts of leached RVNRL films showed a high concentration of the protein herein. This protein was not found in the NH_3 extracts of ethanol soaked films. NRL proteins were shown to decelerate the aging process of Radiation Vulcanized Natural Rubber Latex (RVNRL) films. Among the proteins, herein exhibited good anti-aging properties. The hydrolyzates from NR proteins also enhanced considerably the aging properties of RVNRL. (auth.). 8 refs.; 40 figs.; 30 tabs.

1382 (INIS-mf–14387, [pp. 1]) **Radiation - induced silver agglomeration in A zeolites.** Michalik, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Wasowicz, T.; Sadlo, J.; Pol, A. van der; Boer, E. de. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 1 tab. SILVER 109/electron spin resonance; ZEOLITES/agglomeration; ZEOLITES/irradiation; CLUSTER MODEL; RADIATION EFFECTS; SILVER IONS; ZEOLITES; AGGLOMERATION; IRRADIATION

1383 (INIS-mf–14387, [pp. 1]) **Electron interaction with stabilizing matrix.** Kroh, J. (Politechnika Lodzka, Lodz (Poland). Katedra Chemii Radiacyjnej). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. TRAPPED ELECTRONS/radiation effects; COMPUTERIZED SIMULATION; IRRADIATION; LITHIUM BROMIDES; ORGANIC COMPOUNDS; POTASSIUM BROMIDES; TEMPERATURE RANGE 0065-0273 K; TRAPS

1384 (INIS-mf–14387, [pp. 1]) **ESR studies of the generations and reactions of free radicals in chemical and biochemical systems.** Gilbert, B.C. (York Univ. (United Kingdom)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. RADIOLYSIS/reaction intermediates; RADIOLYSIS/scavenging; ELECTRON SPIN RESONANCE; PHOTOLYSIS; RADICALS; RADIOLYSIS; SCAVENGING; TRAPS

1385 (INIS-mf–14387, [pp. 2]) **Conversion of free radicals upon annealing of x-irradiated single crystal of cholest-4-en-3-one.** Krzyminiewski, R. (Uniwersytet Adama Mickiewicza, Poznan (Poland). Inst. Fizyki); Bernhard, W.; Mercer, K. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. RADICALS/electron spin resonance; STEROIDS/irradiation; STEROIDS/radicals; ANNEALING; ENDOR; MONOCRYSTALS; RADICALS; STEROIDS; IRRADIATION; TEMPERATURE RANGE 0065-0273 K

1386 (INIS-mf–14387, [pp. 1]) **Pulse radiolysis studies of short-lived species in solid amino acids as precursors of radicals detected by ESR.** Zagorski, Z.P. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 2 refs. ELECTRON SPIN RESONANCE/radicals; RADIOLYSIS/amino acids; REACTION INTERMEDIATES/electron spectra; REACTION INTERMEDIATES/radicals; CHERENKOV RADIATION; RADICALS; RADIOLYSIS

1387 (INIS-mf–14387, [pp. 1]) **ESR studies of radiation damage of DNA and proteins.** Symons, M.C.R. (Leicester Univ. (United Kingdom). Dept. of Chemistry). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. ELECTRON SPIN RESONANCE/radicals; ELECTRON SPIN RESONANCE/trapped electrons; RADIOLYSIS/

dna; RADIOLYSIS/proteins; RADICALS; IONS; RADIOLYSIS; DNA; PROTEINS

1388 (INIS-mf–14387, [pp. 1]) **ESR and pulse radiolysis on the free-radical-induced oxidation of phloroglucinol in aqueous solution.** Hildenbrand, K. (Max-Planck-Institut fuer Strahlenchemie, Muelheim an der Ruhr (Germany)); Wang, D.; Gyoergy, I.; Schuchmann, M.N.; Sonntag, C. von. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 2 refs. ELECTRON SPIN RESONANCE/radicals; RADIOLYSIS/phenols; RADICALS; OXIDATION; RADIOLYSIS; PHENOLS

1389 (INIS-mf–14387, [pp. 1]) **Radiation stability of crown ether - metal ions complexes.** Grigoryev, E.I. (Nauchno-Issledovatel'skij Fiziko-Khimicheskij Inst., Moscow (Russian Federation)); Mikhalitsina, O.V.; Nesterov, S.V.; Trakhtenberg, L.I. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 1 ref., 1 tab. RADIOLYSIS/crown ethers; BARIUM COMPLEXES; BERYLLIUM COMPLEXES; CALCIUM COMPLEXES; G VALUE; MAGNESIUM COMPLEXES; RADIOLYSIS; STRONTIUM COMPLEXES

1390 (INIS-mf–14387, [pp. 2]) **Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules.** Charlesby, A. (Science and Engineering Research Council, Swindon (United Kingdom)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. NUCLEAR MAGNETIC RESONANCE/spin-lattice relaxation; RADIOLYSIS/cross-linking; RADIOLYSIS/dna; RADIOLYSIS/polymers; ELECTRON SPIN RESONANCE; RADIOLYSIS; CROSS-LINKING; DNA; POLYMERS

1391 (INIS-mf–14387, [pp. 1]) **Dispersive kinetics of radiation-induced species in condensed media.** Plonka, A. (Politechnika Lodzka, Lodz (Poland). Inst. Techniki Radiacynej). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 2 refs. RADIOLYSIS/reaction intermediates; RADIOLYSIS/reaction kinetics; RADIOLYSIS; SOLIDS

1392 (INIS-mf–14387, [pp. 1]) **ENDOR study of free radicals in X-irradiated glutarimide.** Salih, N.A. (Linkoeping Univ. (Sweden)); Benetis, N.; Lindgren, M.; Lund, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. 1 ref. RADIOLYSIS/glutaric acid; RADIOLYSIS/imides; ELECTRON SPIN RESONANCE; ENDOR; MONOCRYSTALS; RADIOLYSIS; IMIDES; TEMPERATURE RANGE 0065-0273 K

1393 (INIS-mf–14387, [pp. 1]) **An ESR study of sulfur-containing amino acids in aqueous frozen solution.** Pogocki, D. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Burlinska, G.; Sadlo, J.; Wasowicz, T. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. ELECTRON SPIN RESONANCE/radicals; RADIOLYSIS/cysteine; RADIOLYSIS/methionine; RADICALS; GAMMA SOURCES; RADIOLYSIS; CYSTEINE; METHIONINE; TEMPERATURE RANGE 0065-0273 K

1394 (INIS-mf–14387, [pp. 1]) **ESR study of radiation induced radicals in solid peptides.** Burlinska, G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Wasowicz, T.; Michalik, J.; Bobrowski, K. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. ELECTRON SPIN RESONANCE/radicals; RADIOLYSIS/peptides; RADICALS; RADIOLYSIS; PEPTIDES; TEMPERATURE RANGE 0065-0273 K

1395 (INIS-mf–14387, [pp. 1]) **Studies on the detection of radiation treated foodstuffs by the EPR spectroscopy.** Stachowicz, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Burlinska, G.; Michalik, J.; Ostrowski, K.; Dziedzic-Goclawska, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. RADURIZATION/food; RADURIZATION/radicals; ELECTRON SPIN RESONANCE; RADURIZATION; FOOD; RADICALS

1396 (INIS-mf–14387, [pp. 1]) **The EPR detectability levels in molluscs shells exposed to the action of ionizing radiation.** Stachowicz, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Michalik, J.; Burlinska, G.; Sadlo, J.; Ostrowski, K.; Dziedzic-Goclawska, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. MOLLUSCS/irradiation; CUMULATIVE RADIATION EFFECTS; DOSE EQUIVALENTS; DOSE-RESPONSE RELATIONSHIPS; ELECTRON SPIN RESONANCE; MOLLUSCS; IRRADIATION; RADIATION EFFECTS; SENSITIVITY

1397 (INIS-mf–14393, pp. 15-16) **OH radicals induced oxidation of sulfur-containing amino acids. An ESR study.** Pogocki, D. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Burlinska, G.; Sadlo, J.; Wasowicz, T.; Grodkowski, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs., 2 figs., 1 tab. AMINO ACIDS/irradiation; AMINO ACIDS/oxidation; REACTION INTERMEDIATES/electron spin resonance; IRRADIATION; OXIDATION; GAMMA RADIATION; HYDROXYL RADICALS; SULFIDES; SULFUR COMPOUNDS; TEMPERATURE RANGE 0065-0273 K

1398 (INIS-mf–14393, pp. 16-17) **Silver-centred radicals in A zeolites.** Michalik, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Wasowicz, T.; Sadlo, J.; Pol, A. van der. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 9 refs., 2 figs. ZEOLITES/radiolysis; ADDUCTS; ANNEALING; ELECTRON SPIN RESONANCE; METHANOL; REACTION INTERMEDIATES; SILVER IONS; TEMPERATURE RANGE 0065-0273 K; ZEOLITES; RADIOLYSIS

1399 (INIS-mf–14393, pp. 17-19) **An ESR study of gamma irradiated polycrystalline methionine-containing peptides.** Burlinska, G. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Michalik, J.; Bobrowski, K. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 7 refs., 4 figs. ELECTRON SPIN RESONANCE/radicals; RADIOLYSIS/peptides; RADIOLYSIS/reaction intermediates; RADICALS; IRRADIATION; METHIONINE; POLYCRYSTALS; RADIOLYSIS; PEPTIDES; TEMPERATURE RANGE 0065-0273 K

1400 (INIS-mf–14393, pp. 19-20) **Reactivity of halogenorganic radicals in DMSO solution.** Grodkowski, J. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Pogocki, D. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs. RADIOLYSIS/dimethyl sulfide; RADIOLYSIS/organic halogen compounds; RADIOLYSIS/reaction intermediates; REACTION INTERMEDIATES/radicals; REACTION INTERMEDIATES/solvated electrons; OXIDATION; RADIOLYSIS; RADICALS

1401 (INIS-mf–14393, pp. 24-26) **Photochemical and radiation-chemical aspects of matrix acidity effects on organic sulphur compounds.** Ambroz, H.B. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Przybytniak, G.K.; Wronska, T.; Kemp, T.J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs., 4 figs., 1 tab. ELECTRON SPIN RESONANCE/radicals; RADIOLYSIS/organic sulfur compounds; RADIOLYSIS/reaction intermediates; RADICALS; PH VALUE; PHOTOLYSIS; RADIOLYSIS; TEMPERATURE RANGE 0065-0273 K

1402 (INIS-mf–14393, pp. 26-27) **EPR spectroscopy as a tool for radiation exposure measurements on living animals in environment after nuclear contamination.** Stachowicz, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Michalik, J.; Burlinska, G.; Sadlo, J.; Ostrowski, K.; Dziedzic-Goclawska, A.; Wojtowicz, A. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. Polish-American Programme MC-2 (1991-1993). In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs. ELECTRON SPIN RESONANCE/bone tissues; RADIATION DOSES/biological indicators; RADIATION DOSES/cumulative radiation effects; ANIMALS

1403 (INIS-mf–14393, pp. 27-28) **High-LET radiolysis. Pt.1. A facility and its testing.** Stuglik, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Zvara, I. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs., 2 figs. RADIOLYSIS/chemical dosemeters; RADIOLYSIS/let; EQUIPMENT; HEAVY ION ACCELERATORS; ION BEAMS; RADIOLYSIS; LET

1404 (INIS-mf–14393, pp. 28-29) **High-LET radiolysis. Pt.2. To "oxygen in heavy ion track hypothesis".** Stuglik, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 1 fig. RADIOLYSIS/g value; RADIOLYSIS/let; RADIOLYSIS/oxygen enhancement ratio; CARBON 12 BEAMS; RADIOLYSIS; LET

1405 (INIS-mf–14393, pp. 29-31) **High-LET radiolysis. Pt.3. Crystalline α-L-alanine irradiated on ^{12}C and ^{25}Mg ion beams.** Stuglik, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Burlinska, G. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs., 3 figs. RADIOLYSIS/alanine-l; RADIOLYSIS/radicals; CARBON 12 BEAMS; DOSE-RESPONSE RELATIONSHIPS; ELECTRON SPIN RESONANCE; GAMMA RADIATION; ION BEAMS; MAGNESIUM 25; RADIOLYSIS; ALANINE-L; RADICALS

1406 (INIS-mf–14393, pp. 31-32) **Pulse radiolysis of acetonic solutions in presence of silver salts.** Kozlowska-Milner, E. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 10 refs. RADIOLYSIS/acetone; RADIOLYSIS/reaction intermediates; PULSED IRRADIATION; RADIOLYSIS; ACETONE; SILVER COMPOUNDS; SOLUTIONS

1407 (INIS-mf–14393, pp. 32-33) **Spurs in solids.** Zagorski, Z.P. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs., 2 figs. RADIOLYSIS/early radiation effects; RADIOLYSIS/local radiation effects; ALANINES; LET; PULSE TECHNIQUES; RADIOLYSIS; REACTION INTERMEDIATES; SOLIDS; TRYPTOPHAN

1408 (INIS-mf–14393, pp. 33-34) **Indirect chiral effect alanines and tryptophans.** Zagorski, Z.P. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 ref., 1 fig. ALANINES/irradiation; TRYPTOPHAN/irradiation; ALANINES; IRRADIATION; CHIRALITY; RADIATION EFFECTS; TRYPTOPHAN

4007 Radiochemistry and Nuclear Chemistry

Refer also to citation(s) 367, 438, 1360, 1873, 1880

1409 (AREAEE–295) **Electronic spectra of plutonium ions in nitric acid and in lithium nitrate solutions.** Mekhail, F.M. Nuclear Research Centre, Inshas (Egypt). 1987. 28p. Order Number DE95605678. Source: OSTI; NTIS (US Sales Only); INIS.

The absorption spectra of plutonium ions in nitric acid have been described. There is a characteristic change in the absorption spectra of Pu v in lithium nitrate solutions. In 2 M-lithium nitrate a new peak at 969 nm and high absorption at 1200 nm are noticed. A decrease in the absorption by about 20% and the appearance of a new shoulder at 1120 nm in 6 M-lithium nitrate are found. There is no change in the spectrum in 4 M-lithium nitrate. The absorption spectra of plutonium ions in the spectral range 200 - 400 nm are interesting. All plutonium ions have an intense band in the region 250 - 260 nm as well as a less intense and rather diffuse band at 320 - 330 nm in lithium nitrate solutions the sharp band at 250 - 260 nm has disappeared. This suggests that this band is very sensitive to the environmental field. The band is probably produced by $5\ f^{9} \rightarrow 5\ f^{9-1}\ 6\ d$ transition as well as electron transfer. It is believed that the spectrum of Pu V at pH 6.5 represents the hydrolysis product $Pu\ O_2(O\ H)$. 9 fig., 4 tab.

1410 (DOE/ER/75464–3) **Summer schools in nuclear chemistry: Final progress report, February 15, 1991–February 14, 1992.** Baisden, P.A. American Chemical Society, Washington, DC (United States). Div. of Nuclear Chemistry and Technology. Jan 1992. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-89ER75464. Order Number DE95002135. Source: OSTI; NTIS; GPO Dep.

The summer schools conducted in nuclear chemistry and radiochemistry at Brookhaven and San Jose State University are described. Course contents, special lectures, laboratory experiments, field trips, social interactions, etc. are discussed.

1411 (IAERU–9304) **Proceedings of the international seminar on the chemistry of high energy atoms.** Rikkyo Univ., Yokosuka, Kanagawa (Japan). Inst. for Atomic Energy. Dec 1993. 270p. (CONF-9210482–: International seminar on the chemistry of high energy atoms, Tokyo (Japan), 28-30 Oct 1992). Order Number DE95709895. Source: OSTI; NTIS; INIS.

This issue is the collection of the papers presented at the title meeting. The 16 of the presented papers are indexed individually. (J.P.N.).

1412 (IKMz–94-1) **Mainz University, Institute of Nuclear Chemistry. Annual report 1993.** Denschlag, H.O. (ed.). Mainz

Univ. (Germany). Inst. fuer Kernchemie. Mar 1994. 90p. (In German). Order Number DE95711682. Source: OSTI; NTIS (US Sales Only); INIS.

The report presents the results achieved by the Institute's five working groups in the following fields: Development of chemical separation processes, chemistry of ultraheavy elements; Developments in instrumentation; Nuclear fission and heavy ion reactions; Nuclear astrophysics, decay characteristics, structure of atoms and nuclei; Environmental pollution analysis. (orig./EF)

1413 (INIS-mf–13867, pp. 6-10) **Potential for the development and manufacture of radiopharmaceutical kits.** Prokop, J. (Ustav Jaderneho Vyzkumu CSKAE, Rez (Czech Republic)); Budsky, F. Sep 1991. 32p. (In Czech). In *Nuclear medicine. Czech special bulletin. No. 2.* Order Number DE95603340. Source: OSTI; NTIS (US Sales Only); INIS.

English translation available from Nuclear Information Centre, 156 16 Prague - Zbraslav, Czech Republic, at USD 10.- per typewritten page.

A draft programme for the development and production of a basic range of 8 types of radiopharmaceutical kits by the Nuclear Research Institute at Rez is presented for the 1989-1993 period. The products should match foreign equivalents. The results of economic calculations are given and the potential market estimated. The calculated price of a kit is USD 35.8. (J.B.). 8 tabs.

1414 (INIS-mf–14321) **Labelling of meta-iodobenzylguanidine with iodine-131 (I-131-MIBG) for adrenal gland diagnosis.** Sukontpradit, W. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology. 1991. 100p. (In Thai). Order Number DE95603341. Source: OSTI; NTIS (US Sales Only); INIS.

Labelling of meta-iodobenzylguanidine with iodine-131 (I-131 MIBG), for adrenal gland diagnosis has been studied. The MIBG was synthesized from the reaction of meta-iodobenzylamine hydrochloride with cyanamide and labelled with iodine-131 by isotope exchange method using copper(II) as a catalyst. The percentage of labelling was about 98%, with a specific activity of 1.5-2.0 mCi/mg. The radiochemical purity was found to be greater than 99%. Biodistribution studies were performed on mice, the results showed great affinity for the adrenal gland uptake with highest radioactivity after 1 day of injection. The stability of the product with 1% benzyl alcohol was 7 days upon storing at 4^0C.

1415 (INIS-mf–14322) **Radioiodination of testosterone 3-(0-carboxylmethyl) hydroxylamine tyrosine methyl ester.** Thongyoi, C. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology. 1980. 88p. (In Thai). Order Number DE95603342. Source: OSTI; NTIS (US Sales Only); INIS.

The radioiodination of testosterone 3-(0-carboxymethyl) hydroxylamine tyrosine methyl ester can be done by the chloramine-T method. The reaction occurs under an appropriate phosphate buffer solution of pH 7.5 which 70 percent of the labelling yield is obtained. In order to achieve a good pure product, the preparative thin-layer chromatographic method has been performed. After purification radiochemical purity of the product reach to 90 percent and specific activity of more than 35 microcuries per microgram can be obtained. The product after put to the test, proved to be a good tracer for radioimmunoassay of Swamp buffalo testosterone.

1416 (INIS-mf–14340, pp. 317-336) **Radiochemical control of disida kit.** Poramatikul, N.; Sangsuriyan, J.; Paecharien, A.; Thongyoi, C. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

^{99m}Tc-DISIDA, the hepatobiliary agent, can be prepared by labelling of DISIDA kit with Na $^{99m}TcO_4$. Two impurities may be occurred , one in ^{99m}Tc-tin colloid, another is free Na $^{99m}TcO_4$. Each impurity was checked by chromatographic method with commercial DISIDA kit. The appropriate condition would be chosen for checking the OAEP's DISIDA kit. The results indicated that tin colloid and free pertechnetate could be checked by ITlc-SG in methanol and dried-carbonate buffer treated chromatography paper in methylethylketone respectively.

1417 (INIS-mf–14385) **The use of radioisotopes in human experiments: comments in response to recent media articles.** Boyd, R.E. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia)). No corporate text available. Apr 1994. 9p. Order Number DE95605680. Source: OSTI; NTIS (US Sales Only); INIS.

Recent newspaper articles question the propriety and ethical foundation of early experimental programs in which radioisotopes were administered to human subjects. This paper describes the relevant activities of ANSTO's predecessor, the Australian Atomic Energy Commission, and provides an historical background to these and subsequent events.

1418 (INIS-mf–14393) **Annual report 1992.** Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. Order Number DE95605569. Source: OSTI; NTIS; INIS.

The book is a collection of short communications being a review of the scientific activity of the Institute of Nuclear Chemistry and Technology, Warsaw in 1992. The papers are gathered in several branches as follows: radiation chemistry and physics (17), radiochemistry, stable isotopes and nuclear analytical methods (20), radiobiology (7). The last biggest chapter on nuclear technologies and methods has been diluted into four smaller groups concerning: process engineering (5), material engineering, structural studies, diagnostics (17); radiation technologies (7) and nuclear control systems (6). The annual report contains also a general information about the Institute, the full list of scientific papers published, patents granted and their applications, conferences organized by INCT, Ph.D. and D.Sc. thesis as well as list of projects granted by Committee of Scientific Research.

1419 **Production of high specific activity silicon-32.** Phillips, D.R.; Brzezinski, M.A. To Dept. of Energy. 1992. Filed date 25 Sep 1992. U.S. Patent Application 7-950,552. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001778. Source: OSTI; NTIS (US Sales Only); GPO Dep.

A process for preparation of silicon-32 includes dissolving an irradiated KCl target, including spallation products from a prior irradiation, with water, HCl or KOH, filtering the solution, adjusting the pH to from 5.5 to 7.5, admixing sufficient molybdate-reagent to the solution to adjust the pH to 1.5 and to form a silicon-molybdate complex, contacting the solution with a dextran-based material, washing the dextran-based material to remove residual contaminants such as sodium-22, separating the silicon-molybdate complex from the dextran-based material as another solution, adding and hydrogen peroxide to the solution to prevent reformation of the silicon-molybdate complex and to yield an oxidization state of the molybdate adapted for subsequent separation by an anion exchange material, contacting the solution with an anion exchange material to sob the molybdate and optionally adding sufficient alkali metal hydroxide to adjust the pH to 12 to 13.

4008 Combustion, Pyrolysis, and High-Temperature Chemistry

Refer also to citation(s) 1689, 2538

1420 (DOE/ER/13282–10) **Aromatics oxidation and soot formation in flames: Progress report, August 15, 1993–June 30, 1994.** Howard, J.B. Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Chemical Engineering. [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-84ER13282. Order Number DE95001803. Source: OSTI; NTIS; GPO Dep.

This project is concerned with the kinetics and mechanisms of aromatic oxidation and soot and fullerenes formation in flames. The objective of the aromatics oxidation work is to identify and measure the concentration of important intermediates and products in benzene oxidation, and to determine reaction mechanisms and kinetics properties consistent with the behavior seen in flames. The research on soot formation is concerned primarily with the particle inception stages, but the work includes study of soot structure at

all stages of growth in order to obtain mechanistic information from evidence of growth steps recorded in the structure of the particles. The ultimate objective is to understand how nascent soot particles are formed from high molecular weight compounds, including the roles of planar and curved PAH and the relationship between soot and fullerenes. The objective of the proposed research on fullerenes is to develop a more comprehensive understanding of the range of fullerenes formed in flames, the nature of the precursor species, and the mechanisms and kinetics of the formation reactions.

1421 (DOE/ER/14053–T6) **Combustion-related studies using weakly bonded complexes: Final report.** Beaudet, R.A. University of Southern California, Los Angeles, CA (United States). Dept. of Chemistry. Oct 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-89ER14053. Order Number DE95002801. Source: OSTI; NTIS; GPO Dep.

Binary van der Waals complexes and bimolecular reactions relevant to combustion have been prepared and studied using tunable IR diode laser spectroscopy. The complexes were prepared in supersonic expansions using pulsed slit nozzles. In the first phase, geometries and other molecular properties were determined from vibration-rotation spectra. Two complementary classes of binary complexes were continue to be investigated. The first involves molecular oxygen (e.g., O_2-HCN, O_2-HF, O_2-HCl, O_2-HBr, O_2-HI and O_2-hydrocarbons) and the corresponding photoinitiated reactions. The authors obtained spectra O_2-HCl in helium. Such complexes involving triplet state molecules have not been studied, and the spectra are more complex than those whose constituents are simple singlet molecules. These complexes are interesting because upon photodissociating the hydride portion, the reaction of H with O_2 via the vibrationally excited $HO_2^{\dagger}$ intermediate can be studied: $BrH\text{-}O_2 + h\nu(193\ nm) \rightarrow Br\text{-}H\text{-}O_2 \rightarrow Br + HO_2^{\dagger} \rightarrow Br + OH + O$. Also, the authors attempted to study a unique set of species involving oxygen atoms and small molecules such as HF, HCl, HBr, HI, HCN and simple hydrocarbons. A carrier gas was seeded with SO_2 and the second constituent $O(^3P)$ is prepared by 193 nm SO_2 photodissociation. Because the reactions of $O(^3P)$ with small molecules had a significant activation energies, the complexes survive the expansion: e.g., O + HCl has E_{act} = 22 kJ/mol, and the oxygen atom will lie in a shallow well just outside the barrier. Unfortunately, the beam temperature after the photolysis was too warm to preserve van der Waals complexes. The authors also developed IR diode laser spectroscopy as a probe to study bimolecular reactions in a pulsed slit supersonic expansion.

1422 (DOE/ER/25027–8) **Studies in nonlinear problems of energy: Progress report, October 1, 1993–September 30, 1994.** Matkowsky, B.J. Northwestern Univ., Evanston, IL (United States). Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER25027. Order Number DE95001387. Source: OSTI; NTIS; GPO Dep.

The authors concentrate on modeling, analysis and large scale scientific computation of combustion and flame propagation phenomena, with emphasis on the transition from laminar to turbulent combustion. In the transition process a flame passed through a stages exhibiting increasingly complex spatial and temporal patterns which serve as signatures identifying each stage. Often the transitions arise via bifurcation. The authors investigate nonlinear dynamics, bifurcation and pattern formation in the successive stage of transition. They describe the stability of combustion waves, and transitions to combustion waves exhibiting progressively higher degrees of spatio-temporal complexity. One aspect of this research program is the systematic derivation of appropriate, approximate models from the original models governing combustion. The approximate models are then analyzed. The authors are particularly interested in understanding the basic mechanisms affecting combustion, which is a prerequisite to effective control of the process. They are interested in determining the effects of varying various control parameters, such as Nusselt number, Lewis number, heat release, activation energy, Damkohler number, Reynolds number, Prandtl number, Peclet number, etc. The authors have also considered a number of problems in self-propagating high-temperature synthesis (SHS), in which combustion waves are employed to synthesize advanced materials. Efforts are directed toward understanding fundamental mechanisms. 167 refs.

1423 (DOE/PC/92539–8) **Volatiles combustion in fluidized beds: Technical progress report, 4 June 1994–3 September 1994.** Pendergrass, R.A. II; Mansker, L.D.; Hesketh, R.P. Tulsa Univ., OK (United States). Dept. of Chemical Engineering. [1994]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92539. Order Number DE95002642. Source: OSTI; NTIS; GPO Dep.

The goal of this project is to investigate the conditions in which volatiles will burn within both the dense and freeboard regions of fluidized beds. Experiments using a fluidized bed operated at incipient fluidization are being conducted to characterize the effect of particle surface area, initial fuel concentration, and particle type on the inhibition of volatiles within a fluidized bed. The work conducted during the period 4 June 1994 through 3 September 1994 is reported in this technical progress report. The experimental work during this time period consists primarily of data collection. Results of 0.531 mm particle diameter for three equivalence ratios of propane in air are reported. Results at seven temperatures and an average residence time of 2.7 s are reported for the stoichiometric case. The fuel lean case is reported with eight furnace temperatures and an average residence time of 2.6 s. In addition, for the case of fuel rich combustion of propane, ϕ = 2.0, in air, six temperatures and an average residence time of 2.4 s is also reported. This work also includes data collected with a sand particle size of 0. 126 mm diameter. A stoichiometric case of propane in air has been completed for this particle size, in which nine furnace temperatures were used, the sample was taken at a height of 0.54 m above the distributor, and the average residence time was 22.5 s. Samples were also taken at a height of 0.54 m above the distributor for a fuel rich case of propane in air. In this case, seven furnace temperatures were used with an average residence time of 21.4 s. A second set of samples for the 0. 126 mm sand size was sampled at an axial position of 0.06 m above the distributor. A stoichiometric series of experiments is reported for this condition.

1424 (SAND–94-8244) **Correlations for the OH $A^2\Sigma^+(v'=0)$ electronic quenching cross-section.** Paul, P.H. (Sandia National Labs., Livermore, CA (United States)); Carter, C.D.; Gray, J.A.; Durant, J.L. Jr.; Furlanetto, M.R. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002591. Source: OSTI; NTIS; GPO Dep.

This report summarizes recent progress in the development of a model for collisional electronic quenching of OH $A^2\Sigma^+(v'=0)$ by a number of molecules commonly found in combustion and aerodynamic systems. The model provides a means to reliably extend the measurement data base as well as suggesting simple analytic forms which can be used to provide physically plausible fits to the measurements. This report also contains a partial compilation of the available experimental data for collisional electronic quenching of OH $A^2\Sigma^+(v'=0)$.

1425 (SAND–94-8409) **Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material.** Margolis, S.B. (Sandia National Labs., Livermore, CA (United States)); Williams, F.A. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002592. Source: OSTI; NTIS; GPO Dep.

The combustion of condensed materials is known to admit diffusional/thermal instabilities that can lead to various oscillatory modes of burning. In the present work, asymptotic analyses are developed for nonsteady multi-phase deflagration of porous energetic solids, such as degraded nitramine propellants, that experience significant gas flow in the solid preheat region and are characterized by the presence of exothermic reactions in a bubbling melt layer at their surfaces. Relative motion between the gas and condensed phases is taken into account in both regions, and the derived asymptotic model is analyzed to obtain an explicit solution for steady, planar deflagration and a dispersion relation describing its linear stability. The latter determines a pulsating neutral stability boundary in the nondimensional activation energy -

disturbance wavenumber plane beyond which nonsteady, nonplanar solutions are anticipated. Focusing on the realistic limit of small ratios of gas-phase to condensed-phase density and thermal conductivity, it is shown that the effect of a nonzero porosity α_s of the unburned solid material is generally destabilizing, by an amount proportional to $\alpha_s(1-\alpha_s)^{-1}$, relative to the nonporous case. This effect arises both from the lower combustion temperature of the porous energetic material and from the gas-phase diffusion of heat from the reaction zone towards the porous preheat region. These results therefore suggest that degraded propellants, which exhibit greater porosity than their undamaged counterparts, may be especially prone to nonsteady deflagration.

1426 (SAND–94-8730C) **Temporal evolution of turbulence/chemistry interactions in lifted, turbulent-jet flames.** Schefer, R.W. (Sandia National Labs., Livermore, CA (United States)); Namazian, M.; Filtopoulos, E.E.J.; Kelly, J. Sandia National Labs., Livermore, CA (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States);Gas Research Inst., Chicago, IL (United States). DOE Contract AC04-76DP00789. (CONF-940711–18: 25. international symposium on combustion, Irvine, CA (United States), 31 Jul - 5 aug 1994). Order Number DE95002481. Source: OSTI; NTIS; GPO Dep.

Flame ignition, extinction and reignition that control flame stability are time dependent. Two-pulse images of the instantaneous CH/CH_4 distributions, with a variable time delay between images, were used to study the temporal evolution of turbulence/chemistry interactions in lifted, turbulent CH_4-jet flames. The jet exit velocity was 21 m/s (jet exit Reynolds number 7,000). The results emphasize interactions between turbulence structure and the flame that lead to large fluctuations in experimental flame lift-off height. The results show that the flame envelope curves around semi-organized, large-scale vortical structures formed along the periphery of the jet. Interactions between these vortical structures and the flame cause excessive stretch that leads to local flame extinction. Extinction occurs on both the downstream edges of the structures and on the upstream sides. Once the flame is extinguished by a vortical structure, the flame stabilization point can be carried significant distances downstream by the vortex. The return to an upstream stabilization location occurs through turbulent premixed flame propagation. The images show upstream propagation of the flame within the image plane. Evidence also exists for the importance of flame propagation in the azimuthal direction normal to the image plane.

42 ENGINEERING

1427 (CONF-9411137–1) **Adventures in supercomputing, a K-12 program in computational science: An assessment.** Oliver, C.E. (Oak Ridge National Lab., TN (United States)); Hicks, H.R.; Iles-Brechak, K.D.; Honey, M.; McMillan, K. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Frontiers in education conference; San Jose, CA (United States); 3-6 Nov 1994. Order Number DE95001350. Source: OSTI; NTIS; GPO Dep.

In this paper, the authors describe only those elements of the Department of Energy Adventures in Supercomputing (AiS) program for high school teachers, such as school selection, which have a direct bearing on assessment. Schools submit an application to participate in the AiS program. They propose a team of at least two teachers to implement the AiS curriculum. The applications are evaluated by selection committees in each of the five participating states to determine which schools are the most qualified to carry out the program and reach a significant number of women, minorities, and economically disadvantaged students, all of whom have historically been underrepresented in the sciences. Typically, selected schools either have a large disadvantaged student population, or the applying teachers propose specific means to attract these segments of their student body into AiS classes. Some areas with AiS schools have significant numbers of minority students, some have economically disadvantaged, usually rural, students, and all areas have the potential to reach a higher proportion of women than technical classes usually attract. This report presents preliminary findings based on three types of data: demographic, student journals, and contextual. Demographic information is obtained for both students and teachers. Students have been asked to maintain journals which include replies to specific questions that are posed each month. An analysis of the answers to these questions helps to form a picture of how students progress through the course of the school year. Onsite visits by assessment professionals conducting student and teacher interviews, provide a more in depth, qualitative basis for understanding student motivations.

4202 Facilities, Equipment, and Techniques

Refer also to citation(s) 176, 186, 220, 269, 304, 352, 358, 369, 370, 371, 374, 380, 381, 397, 402, 415, 424, 425, 496, 513, 524, 525, 527, 719, 1002, 1466, 1649, 1671

1428 (BNL–60902) **Specification of the figure and finish of EUV mirrors in terms of performance requirements.** Church, E.L.; Takacs, P.Z. Brookhaven National Lab., Upton, NY (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9409177–4: Optical Society of America conference on extreme ultraviolet lithography, Monterey, CA (United States), 19-21 Sep 1994). Order Number DE95002927. Source: OSTI; NTIS; GPO Dep.

All manufacturing processes involve errors. In the case of bare and multilayer mirrors these unavoidable errors introduce near-field fluctuations in the reflected wavefront which propagate to the far field and degrade imaging performance. In order to specify manufacturing tolerances in terms of performance requirements one must known the connection between the two–the finish-function relationship. This paper discusses the form of that relationship derived using elementary statistical diffraction theory. It tells one what statistical properties of the surface errors are relevant, it spells out the important role of the system parameters for EUV mirrors which is absent for conventional mirrors, and it leads to simple good-bad tests for mirror quality. These results are an extension of previous work in this area.

1429 (CONF-9405109–11) **Thermal modeling of packages for normal conditions of transport with isolation.** Anderson, J.C.; Feldman, M.R. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Department of Energy defense programs packaging workshop; Knoxville, TN (United States); 16-19 May 1994. Order Number DE94017749. Source: OSTI; NTIS; GPO Dep.

As part of the Safety Analysis Report for (SARP) for each special nuclear materials package, experimental tests or an analysis must be performed to determine the temperature distribution throughout the package when exposed to normal conditions of transport. These normal conditions include two cases – one with insolation and one without insolation. Insolation (total solar heat load) values to be used in the analyses are given in 10 CFR 71.71; however, the manner in which the insolation is to be applied is not specified. Several approaches can be taken: (1) perform a steady-state analysis assuming the insolation is applied continuously, (2) perform a transient analysis assuming the incident insolation is represented by a step function (i.e., insolation is applied and then not applied in 12-hour cycles), or (3) perform a transient analysis where the incident insolation is represented by a more complex function involving variables such as time of day. The purpose of this paper is to present these various approaches and examine the effect they have on package temperature distributions. The DC-1 shipping package with the Z88 can was used for the analyses to represent a typical thin-walled Celotex-based shipping package.

1430 (CONF-9405206–) **Proceedings of the Low-Slope Reroofing Workshop: A review of the alternatives.** Desjarlais, A.O. (comp.). Oak Ridge National Lab., TN (United States). Sep 1994. 265p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Workshop on low slope re-roofing: a review of alternatives; Oak Ridge, TN (United States); 24-25 May 1994. Order Number DE94019240. Source: OSTI; NTIS; GPO Dep.

Topics that were discussed at this workshop include: tear-off versus recover, design and application issues, reroofing system options, and reroofing case histories. Individual papers and group discussions are presented.

1431 (CONF-9407130–Summ.) **[Low-slope re-roofing workshop keynote].** Christian, J.E. Oak Ridge National Lab., TN (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Low-slope re-roofing workshop; Oak Ridge, TN (United States); 18 Jul 1994. Order Number DE95000495. Source: OSTI; NTIS; GPO Dep.

This opening speech from the meeting held at ORNL describes the Buildings Technology Center and its national goals, and the ORNL roofing program including its mission, accomplishments, and future.

1432 (CONF-9410186–1) **Unknown-terrains navigation of a mobile robot using an array of sonars.** Rao, N.S.V. Oak Ridge National Lab., TN (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on robotics motion and machine vision; Aachen (Germany); 31 Oct - 4 nov 1994. Order Number DE94017902. Source: OSTI; NTIS; GPO Dep.

A mobile robot equipped with an array of sonars is required to navigate to a destination through a planar terrain populated by polygonal obstacles whose locations and shapes are unknown. A navigation method is proposed based on a trapezoidal decomposition of tile terrain for an abstract formulation, where elementary navigational steps consist of following the obstacle edges and turning around the corners. The convergence of an abstract version of the algorithm is first analytically established. Then experimental results on implementing the algorithm on an experimental mobile robot are reported.

1433 (DOE/MC/29113–3912) **Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April–June, 1994.** Mechanical Technology, Inc., Latham, NY (United States). 1 Aug 1994. 224p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE95001479. Source: OSTI; NTIS; GPO Dep.

The Interactive, Computer-Enhanced, Remote Viewing System (ICERVS) is a system designed to provide a reliable geometric description of a robotic task space in a fashion that enables robotic remediation to be carried out more efficiently and economically than with present systems. The key elements are a faithful way to store empirical data and a friendly user interface that provides an operator with timely access to all that is known about a scene. ICERVS will help an operator to analyze a scene and generate additional geometric data for automating significant portions of the remediation activity. The development of ICERVS is to occur in three phases. The development of ICERVS is to occur in three phases. Phase 1 will focus on the development of the Data Library, which contains the geometric data about the task space and the objects in it, and the Toolkit, which includes the mechanisms for manipulating and displaying both empirical and model data. Phase 2 will concentrate on integrating these subsystems with a sensor subsystem into one working system. Some additional functionality will be incorporated in the Data Library and Toolkit subsystems. Phase 3 will expand the configuration to meet the needs of a full scale demonstration of the interactive mapping of some waste site to be identified. The second Phase of the ICERVS project consists of nine tasks which are described in Attachment A. This listing includes the eight tasks originally proposed together with an additional task to supply a working copy of ICERVS to INEL for use with the Buried Waste Integrated Demonstration (BWID). ICERVS software implementation is almost complete and integration of the ICERVS Phase 2 software has begun.

1434 (DPW–56-371) **Report of trip to Los Alamos, Albuquerque Operations Office, and ACF Industries, September 17–19, 1956.** Crawley, J.E. Jr. Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Explosives Dept. 9 Oct 1956. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-76SR00001. (SR/H–785). Order Number DE94017646. Source: OSTI; NTIS; GPO Dep.

This report describes travel to Los Alamos Scientific Laboratory September 17, and 19, ALOO and ACF Industries, Inc. At Los Alamos the principal subjects discussed were reservoir design, and reservoir shipping specifications. In Albuquerque a meeting was held with Albuquerque Operations Office personnel to discuss design and procurement of shipping containers, followed by discussions with ACF of reservoir fabrication and testing.

1435 (ETDE/DE-mf–95716360) **Double-fed asynchronous machine with electronic inverter as 3 phase AC generator for constant frequency and voltage with variable speed drive, preferred as wave generator on ships. Vol. 2: Final report.** Ruessel, K.; Zipfel, J. Germanischer Lloyd, Hamburg (Germany). 1990. 146p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT MTK0363. Order Number DE95716360. Source: OSTI; NTIS (US Sales Only).

The aim of the project is the investigation of new types of wave generator systems using asynchronous machines. The investigation was carried out as a joint project by the firms of Siemens AG, Technical University of Hamburg-Harburg, German Lloyd, Electrical Department. (HM)

1436 (ETDE/DE-mf–95716362) **Double-fed asynchronous machine with electronic inverter as 3 phase AC generator for constant frequency and voltage with variable speed drive, preferred as wave generator on ships. Vol. 1: Final report.** Paduch, W.; Ruessel, K. Germanischer Lloyd, Hamburg (Germany). 1990. 187p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT MTK0363. Order Number DE95716362. Source: OSTI; NTIS (US Sales Only).

The aim of the project is the investigation of new types of wave generator systems using asynchronous machines. The investigation was carried out as a joint project by the firms of Siemens AG, Technical University of Hamburg-Harburg, German Lloyd, Electrical Department. (HM)

1437 (INIS-JP–018, pp. 557-564) **Thermal test and analysis for transporting vitrified high-level radioactive wastes.** Yamakawa, H. (Central Research Inst. of Electric Power Industry, Abiko, Chiba (Japan). Abiko Research Lab.); Gomi, Y.; Ozaki, S.; Kato, O.; Tamaki, H. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

As a part of the safety demonstration tests for transport casks of high level radioactive vitrified wastes, the thermal tests of the cask (left unattended at an ambient temperature of 38degC for a period of one week) were executed before and after the side free drop test (from height of 30 cm). This condition was set according to the prospect of the damage of contents (baskets, etc.) by the impact force at the drop test. It was shown that the cask temperatures at the representative parts, such as the vitrified wastes, the containment system, and the protection wire net, were lower than allowable values. From the result of measured temperatures it was considered that no damages and no large deformations could happen to the contents in this drop test. Thermal analysis was also done to establish the analysis model. (J.P.N.).

1438 (INIS-JP–018, pp. 565-571) **Heat transfer tests by slice model of high performance spent fuel shipping cask.** Fukazawa, Akio (Nuclear Fuel Transport Co. Ltd., Tokyo (Japan)); Ohsono, Katsunari; Ohashi, Masao. 1993. 1709p. (CONF-920905–: PATRAM '92: 10th international symposium on the packaging and transportation of radioactive materials, Yokohama (Japan), 13-18 Sep 1992). In *The 10th international symposium on the packaging and transportation of radioactive materials: Proceedings.* Order Number DE94737964. Source: OSTI; NTIS; INIS.

Composed of three volumes.

In consideration of high burn-up plan for LWR fuel, the HP-CASK has been designed to transport more contents than the existing casks. The high performance cask required a high heat transfer

performance inside the cask body, because the strong intensity of the neutron source due to the contents required use of a thick resin shielding layer. This led to a design in which internal fins welded at both ends were provided in the resin layer to ensure heat transfer performance, which was verified by means of a slice model heat transfer test. It was shown, as a result, that the heat transfer performance in the cask body had a performance as originally designed. (J.P.N.).

1439 (JAERI-Tech–94-005) **Initial tank calibration at NUCEF critical facility. 2: Data analysis.** Yanagisawa, Hiroshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 190p. (In Japanese). Order Number DE95709891. Source: OSTI; NTIS; INIS.

Analyses on initial tank calibration data were carried out for the purpose of the nuclear material accountancy and control for critical facilities in NUCEF: Nuclear Fuel Cycle Safety Engineering Research Facility. Calibration functions to evaluate volume of nuclear material solution in accountancy tanks were determined by regression analysis on the data considering dimension and shape of the tank. The analyses on dip-tube separation (probe separation), which are necessary to evaluate solution density in the tanks, were also carried out. As a result, regression errors of volume calculated with the calibration functions were within 0.05 lit. (0.01%) at a nominal level of Pu accountancy tanks. Errors of the evaluated dip-tube separations were also small, e.g. within 0.2mm (0.11%). Therefore, it was estimated that systematic errors of bulk measurements would satisfy the target value of NUCEF critical facilities (0.3% for Pu accountancy tanks). This paper summarizes the data analysis methods, results of analysis and evaluated errors. (author).

1440 (LA-SUB–94-137) **Relocation and repair of the National Geotechnical Centrifuge: Final report.** Cheney, J.A. (California Univ., Davis, CA (United States). Center for Geotechnical Modeling). Los Alamos National Lab., NM (United States); California Univ., Davis, CA (United States). Center for Geotechnical Modeling. [1994]. 127p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001746. Source: OSTI; NTIS; GPO Dep.

In January of 1984, the large geotechnical centrifuge located at NASA Ames Research Center, was in the first stages of operational checkout when the main thrust bearing of the large D.C. drive motor failed. After many months of investigation and proposals for repair of the facility, it became evident that it would be far more advantageous to the engineering community to remove those components of the centrifuge that were undamaged to the Davis campus and replace the drive system completely. The large centrifuge had cost over 2 million dollars to build, and it would have been irresponsible to simply scrap it. Recognizing this fact, funds were solicited and received from various sources, and Beam Engineering Inc. was contracted to design and construct the centrifuge at its new location. The University of California contributed a quarter of a million dollars and Tyndall Air Force Base, through Los Alamos National Laboratory, contributed $140,000. There were funds also contributed by LANL, LLNL, US Navy and NSF. The first stage in the phased development of the newly located centrifuge is nearing completion, which prompts the writing of this report. By the time that this report reaches the reader the first runs of the centrifuge will have been completed. The present report describes the present capability of the centrifuge and the plans for upgrading as time goes on. Several pilot studies were carried out. The experiments involved (1) the effects of nearby explosions on buried thin walled containers and (2) the advection and dispersion of toxic waste water through soils.

1441 (LA-UR–94-3181) **LISK-BROOM: Clearing near-Earth space debris in 4 years using a 20-kW, 530-nm repetitively pulsed laser.** Phipps, C.R. (Los Alamos National Lab., NM (United States)); Michaelis, M.M. Los Alamos National Lab., NM (United States). [1994]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409225–1: Physics of nuclear induced plasmas and problems of nuclear pumped lasers, Arzamas (Russian Federation), 26-30 Sep 1994). Order Number DE95000916. Source: OSTI; NTIS; GPO Dep.

When space debris forced a change of plan for a recent US Space Shuttle mission, it finally reached the point of broad awareness. Almost a million pieces of debris have been generated by 35 years of spaceflight, and now threaten some long-term space missions. This problem can best a be solved by causing space debris items to re-enter and burn up in the atmosphere on a computed trajectory. Illumination of the objects by a repetitively-pulsed laser will easily produce a laser-ablation jet providing the impulse to deorbit the object. For reasons we will discuss, we propose the use of a ground-based laser system, atmospheric-turbulence compensating beam director, computer and high resolution detection system to solve this problem. A laser of just 2OkW average power and state-of-the-art detection capabilities could clear near-Earth space below 1100km altitude of all space debris larger than 1 cm but less massive than 100kg in about 4 years. The LISK-BROOM laser would be located near the Equator above 5km elevation [e.g., the Uhuru site on Kilimanjarol, minimizing turbulence correction and absorption of the 530-nm wavelength laser beam. LISK-BROOM is a special case of Laser Impulse Space Propulsion (LISP), by which objects are propelled in space by the ablation jet due to a distant laser. We will also discuss active beam phase error correction during passage through the atmosphere and the object detection system which are necessary.

1442 (NUREG/CR–5403) **Predicting the pressure driven flow of gases through micro-capillaries and micro-orifices.** Anderson, B.L. (Lawrence Livermore National Lab., CA (United States)); Carlson, R.W.; Fischer, L.E. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Industrial and Medical Nuclear Safety; Lawrence Livermore National Lab., CA (United States). Nov 1994. 12p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract W-7405-ENG-48. (UCRL-ID–118245). Source: OSTI; NTIS; INIS; GPO.

A large body of experimentally measured gas flow rates were obtained from the literature and then compared to the predictions obtained with constitutive flow equations. This was done to determine whether the equations apply to the predictions of gas flow rates from leaking containment vessels used to transport radioactive materials. The experiments consisted of measuring the volumetric pressure-driven flow of gases through micro-capillaries and micro-orifices. The experimental results were compared to the predictions obtained with the equations given in ANSI N14.5 the American National Standard for Radioactive Materials-Leakage Tests on Package for Shipment. The equations were applied to both (1) the data set according to the recommendations given in ANSI N14.5 and (2) globally to the complete data set. It was found that: The continuum and molecular flow equation provided good agreement between the experimental and calculated flow rates for flow rates less than about 1 atm·cm^3/s. The choked flow equation resulted in over-prediction of the flow rates for flow rates less than about 1 atm·cm^3/s. For flow rates higher than 1 atm·cm^3/s, the molecular and continuum flow equation over-predicted the measured flow rates and the predictions obtained with the choked flow equation agreed well with the experimental values. Since the flow rates of interest for packages used to transport radioactive materials are almost always less than 1 atm·cm^3/s, it is suggested that the continuum and molecular flow equation be used for gas flow rate predictions related to these applications.

1443 (POEF-T–3636) **Validation of Nuclear Criticality Safety Software and 27 energy group ENDF/B-IV cross sections.** Lee, B.L. Jr. Portsmouth Gaseous Diffusion Plant, OH (United States). Aug 1994. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76OR00001. Order Number DE95001509. Source: OSTI; NTIS; INIS; GPO Dep.

The validation documented in this report is based on calculations that were executed during June through August 1992, and was completed in June 1993. The statistical analyses in Appendix C and Appendix D were completed in October 1993. This validation gives Portsmouth NCS personnel a basis for performing computerized KENO V.a calculations using the Martin Marietta Nuclear Criticality Safety Software. The first portion of the document outlines basic information in regard to validation of NCSS using ENDF/B-IV 27-group cross sections on the IBM 3090 at ORNL. A

basic discussion of the NCSS system is provided, some discussion on the validation database and validation in general. Then follows a detailed description of the statistical analysis which was applied. The results of this validation indicate that the NCSS software may be used with confidence for criticality calculations at the Portsmouth Gaseous Diffusion Plant. When the validation results are treated as a single group, there is 95% confidence that 99.9% of future calculations of similar critical systems will have a calculated $K_{eff} > 0.9616$. Based on this result the Portsmouth Nuclear Criticality Safety Department has adopted the calculational acceptance criteria that a $k_{eff} + 2\sigma \leq 0.95$ is safety subcritical. The validation of NCSS on the IBM 3090 at ORNL was extended to include NCSS on the IBM 3090 at K-25.

1444 (SAND–93-3909C) **Computational design of hypervelocity launchers.** Trucano, T.; Chhabildas, L. Sandia National Labs., Albuquerque, NM (United States). [1993]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410131–7: 1994 hypervelocity impact symposium, Santa Fe, NM (United States), 16-20 Oct 1994). Order Number DE95000744. Source: OSTI; NTIS; GPO Dep.

The Sandia Hypervelocity Launcher (HVL) uses impact techniques on a two-stage light-gas gun to launch flier plates to velocities in excess of 10 km/s. An important problem in designing successful third stage techniques for impact launching fliers to such velocities is detailed understanding of the interior ballistic performance of the third stage. This is crucial for preventing melt and fracture of the flier plates during the extraordinary accelerations that they undergo (accelerations on the order of 10^9 g are typical on the HVL). We seek to optimize HVL launch conditions in order to achieve two major goals: first, to maximize the potential launch velocity for a given flier, and second, to allow different flier configurations. One tool that we can apply in studying HVL performance is the use of multi-dimensional wave propagation codes. We have used such codes, particularly the Sandia Eulerian code CTH, to study a variety of interior ballistics issues related to gun performance and launcher development for almost ten years. Recently this work has culminated in a major contribution to HVL design, namely the capability to launch "chunk" fliers. 'Me initial phases of design development were solely devoted to CTH computations that studied potential designs, identified problems, and posed possible solutions for launching chunk fliers on the HVL. Our computations sufficiently narrowed the design space to the point that systematic experimental progress was possible. Our first experiment resulted in the successful launch of an intact 0.33 gram titanium alloy chunk flier to a velocity of 10.2 km/s. The thickness to diameter ratio of this flier was approximately 0.5.

1445 (SAND–94-1181C) **Damage detection and health monitoring of operational structures.** James, G.; Mayes, R.; Carne, T.; Reese, G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by Federal Aviation Administration, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941142–22: American Society of Mechanical Engineers' winter annual meeting, Chicago, IL (United States), 9-11 Nov 1994). Order Number DE94018896. Source: OSTI; NTIS; GPO Dep.

Initial damage detection/health monitoring experiments have been performed on three different operational structures: a fracture critical bridge, a composite wind turbine blade, and an aging aircraft. An induced damage test was performed on the Rio Grande/I40 bridge before its demolition. The composite wind turbine test was fatgued to failure with periodic modal testing performed throughout the testing. The front fuselage of a DC-9 aircraft was used as the testbed for an induced damage test. These tests have yielded important insights into techniques for experimental damage detection on real structures. Additionally, the data are currently being used with current damage detection algorithms to further develop the numerical technology. State of the art testing technologies such as, high density modal testing, scanning laser vibrometry and natural excitation testing have also been utilized for these tests.

1446 (SAND–94-1664) **A field test and evaluation of exterior fiber optic intrusion detection sensors.** Wolfenbarger, F.M. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002589. Source: OSTI; NTIS; GPO Dep.

Four commercial exterior fiber optic intrusion detection sensors installed in a gravel test bed have been evaluated. These are the FOIDS models 1000 and 500, Sabreline, and Fiber SenSys model M106E. In addition, FOIDS models 1000 and 500 installed on a fence were evaluated. The data was obtained from a perimeter sensor test field in Albuquerque.

1447 (SAND–94-1819) **Assembly partitioning with a constant number of translations.** Halperin, D. (Stanford Univ., Stanford, CA (United States)); Wilson, R.H. Sandia National Labs., Albuquerque, NM (United States). 24 Aug 1994. 18p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001857. Source: OSTI; NTIS; GPO Dep.

The authors consider the following problem that arises in assembly planning: given an assembly, identify a subassembly that can be removed as a rigid object without disturbing the rest of the assembly. This is the assembly partitioning problem. Specifically, they consider planar assemblies of simple polygons and subassembly removal paths consisting of a single finite translation followed by a translation to infinity. They show that such a subassembly and removal path can be determined in $O(n^{1.46}N^6)$ time, where n is the number of polygons in the assembly and N is the total number of edges and vertices of all the parts together. They then extend this formulation to removal paths consisting of a small number of finite translations, followed by a translation to infinity. In this case the algorithm runs in time polynomial in the number of parts, but exponential in the number of translations a path may contain.

1448 (SAND–94-2354C) **Advanced robotic technologies for transfer at Sandia National Laboratories.** Bennett, P.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-940917–1: 3. international conference on heat transfer: advanced computational methods in heat transfer, Southampton (United Kingdom), 5-7 Sep 1994). Order Number DE95001617. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous operations which have in the past been completed by technicians are under increased scrutiny due to high costs and low productivity associated with providing protective clothing and environments. As a result, remote systems are needed to accomplish many hazardous materials handling tasks such as the clean-up of waste sites in which the exposure of personnel to radiation, chemical, explosive and other hazardous constituents is unacceptable. Computer models augmented by sensing, and structured, modular computing environments are proving effective in automating many unstructured hazardous tasks. Work at Sandia National Laboratories (SNL) has focused on applying flexible automation (robotics) to meet the needs of the U.S. Department of Energy (USDOE). Dismantling facilities, environmental remediation, and materials handling in changing, hazardous environments lead to many technical challenges. Computer planning, monitoring and operator assistance shorten training cycles, reduce errors, and speed execution of operations. Robotic systems that re-use well-understood generic technologies can be much better characterized than robotic systems developed for a particular application, leading to a more reliable and safer systems. Further safety in robotic operations results from use of environmental sensors and knowledge of the task and environment. Collision detection and avoidance is achieved from such sensor integration and model-based control. This paper discusses selected technologies developed at SNL for use within the USDOE complex that have been or are ready for transfer to government and industrial suppliers. These technologies include sensors, sub-systems, and the design philosophy applied to quickly integrate them into a working robotic system. This paper represents the work of many people at the Intelligent Systems and Robotics Center at SNL, to whom the credit belongs.

1449 (SAND–94-8245) **Piercing tool, Transportation Accident Resistant Container (TARC).** Lari, P. Sandia National Labs., Livermore, CA (United States). Aug 1994. 37p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE94017684. Source: OSTI; NTIS; GPO Dep.

Transportation Accident Resistant Containers (TARC)s are used for enhanced safety during movement of nuclear weapons. Its design features a tough stainless steel outer skin, redwood for impact mitigation and fire protection and a rugged aluminum inner container. Redwood absorbs impact energy by crushing, similar to the way foam crushes in other containers. Redwood also functions to insulate the weapon from heat and fire. When a TARC is involved in a fire, the redwood will slowly burn forming a good insulating char. The redwood can continue to smolder once the fire is out. To ensure the smolder is extinguished, water can be directed into any accident caused hole in the skin. If no hole exists, it may be necessary to create one. This document discusses tool selection, testing, and a simple but effective method of creating an access hole in the outer skin large enough to apply fire fighting techniques.

1450 (STUK-YTO-TR–51) **Periodic testing of safety valves of nuclear facilities: Bases, procedures and requirements.** Nissilae, M. (Technical Research Centre of Finland, Espoo (Finland)); Reunanen, M.; Vuori, M. Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland). Apr 1993. 46p. (In Finnish). Order Number DE95606397. Source: OSTI; NTIS; INIS.

The report is concerned with the periodic performance testing of the pressure relief devices, i.e. safety and relief valves, used in nuclear power plants. The factors affecting the operation of safety and relief valves are described and the requirements and instructions presented in the literature for testing of safety and relief valves are reviewed. Moreover, some testing procedures and related equipment based on pertinent literature are presented. (30 refs., 11 figs., 4 tabs.).

1451 (UCRL-JC–117078) **Computational model of drilling with high radiance pulsed lasers.** Boley, C.D. Lawrence Livermore National Lab., CA (United States). 8 Aug 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410189–1: Applications of lasers and electro-optics, Orlando, FL (United States), 17-20 Oct 1994). Order Number DE94018548. Source: OSTI; NTIS; GPO Dep.

This paper describes a model of drilling by high radiance pulsed lasers. The model contains a one-dimensional description of heat transport below the bottom of the hole, hydrodynamic expansion of the vapor and compressed air, and light propagation through the vapor. The pressure and energy of the vapor are taken from a separate Saha equilibrium code. The boundary conditions at the vaporization surface include the formation of a Knudsen layer within which macroscopic fluid conditions are reached. The absorption mechanisms in the pertinent range of densities and temperatures are photoionization and inverse bremsstrahlung. The model has been applied to the case of drilling in stainless steel with green copper laser light, for peak input intensities ranging from 10^8 to 5×10^{10} W/cm^2. Below 3×10^8 W/cm^2, their is negligible absorption in the vapor and ablation increases rapidly with intensity. Above this point, ablation still generally increases with intensity, because of a combination of partially penetrating light and electron thermal conduction to the surface. The predicted ablation rates agree semiquantitatively with experiment.

1452 (UCRL-JC–117820) **A mixed time integration method for large scale acoustic fluid-structure interaction.** Christon, M.A.; Wineman, S.J.; Goudreau, G.L.; Foch, J.D. Lawrence Livermore National Lab., CA (United States). 18 Jul 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941142–20: American Society of Mechanical Engineers' winter annual meeting, Chicago, IL (United States), 9-11 Nov 1994). Order Number DE94018327. Source: OSTI; NTIS; GPO Dep.

The transient, coupled, interaction of sound with structures is a process in which an acoustic fluid surrounding an elastic body contributes to the effective inertia and elasticity of the body. Conversely, the presence of an elastic body in an acoustic medium influences the behavior of propagating disturbances. This paper details the application of a mixed explicit-implicit time integration algorithm to the fully coupled acoustic fluidstructure interaction problem. Based upon a dispersion analysis of the semi-discrete wave equation a second-order, explicit scheme for solving the wave equation is developed. The combination of a highly vectorized, explicit, acoustic fluid solver with an implicit structural code for linear elastodynamics has resulted in a simulation tool, PING, for acoustic fluid-structure interaction. PING's execution rates range from $1\mu s$/Element/δt for rigid scattering to $10\mu s$/Element/δt for fully coupled problems. Several examples of PING's application to 3-D problems serve in part to validate the code, and also to demonstrate the capability to treat complex geometry, acoustic fluid-structure problems which require high resolution meshes.

1453 (WHC-SA–2141) **Seismic qualification of ventilation stack.** Chen, W.W.; Huang, S.N.; Lindquist, M.R. Westinghouse Hanford Co., Richland, WA (United States). Oct 1993. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-940613–27: 1994 pressure vessels and piping conference, Minneapolis, MN (United States), 19-23 Jun 1994). Order Number DE95001987. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the method to be used to qualify the 105 K ventilation stack at the U.S. Department of Energy's Hanford Site, near Richland, Washington, under seismic and wind loadings. The stack stands at 175 ft (53.34 m), with a diameter tapering from 22 ft (6.71 m) at the foundation to 12.83 ft (3.91 m) at the top. Although the stack is classified as Safety Class 3 (low hazard), it is treated as a Safety Class 1 (high hazard) component, as failure could damage a Safety Class 1 facility (the irradiated fuel storage basin). The evaluation used U.S. Department of Energy criteria specified in UCRL 15910 (1990). The seismic responses of the stack under earthquake loading were obtained from modal analyses with response spectrum input that used the ANSYS (1989) finite-element computer code. The moments and shear forces from the results of seismic analysis were used to qualify the reinforcement capacity of the stack structure by the ultimate-strength method. The wind forces acting on the stack in both along-wind and crosswind directions were also calculated. Presented are evaluations of the soil bearing pressure, the moment, and the shear capacity of the stack foundation.

1454 (WHC-SD-GN-CSWD–30036-Rev.1) **SASSI system software configuration.** Weiner, E.O. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002141. Source: OSTI; NTIS; GPO Dep.

The SASSI (System for Analysis for Soil-Structure Interaction) computer program was obtained by WHC from the University of California at Berkeley for seismic structural analysis of complex embedded building configurations. SASSI was developed in the 1980's by a team of doctoral students under the direction of Prof. J. Lysmer. The program treats three-dimensional soil-structure interaction problems with the flexible volume substructuring method. In the 1970's, the same organization developed the FLUSH program, which has achieved widespread international usage in the seismic analysis of structures. SASSI consists of nine modules, each of which are to be run as a separate execution. The SASSI source code, dated 1989 and identified as a Cray version, was put up on the RL Cray XM/232 Unicos system in 1991. That system was removed at the end of 1993, and SASSI is now installed on the LANL Cray YMP systems.

1455 (WHC-SD-GN-DGS–30011) **Radiological design guide.** Evans, R.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Aug 1994. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001566. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this design guide is to provide radiological safety requirements, standards, and information necessary for designing facilities that will operate without unacceptable risk to personnel, the public, or the environment as required by the US Department of Energy (DOE). This design guide, together with WHC-CM-4-29, Nuclear Criticality Safety, WHC-CM-4-46, Nonreactor Facility Safety Analysis, and WHC-CM-7-5, Environmental Compliance, covers the radiation safety design requirements at Westinghouse Hanford Company (WHC). This design guide applies to the design of all new facilities. The WHC organization with line responsibility

for design shall determine to what extent this design guide shall apply to the modifications to existing facilities. In making this determination, consideration shall include a cost versus benefit study. Specifically, facilities that store, handle, or process radioactive materials will be covered. This design guide replaces WHC-CM-4-9 and is designated a living document. This design guide is intended for design purposes only. Design criteria are different from operational criteria and often more stringent. Criteria that might be acceptable for operations might not be adequate for design.

1456 (WHC-SD-GN-SA–30006) **Evaluation of near-field earthquake effects.** Shrivastava, H.P. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002120. Source: OSTI; NTIS; INIS; GPO Dep.

Structures and equipment, which are qualified for the design basis earthquake (DBE) and have anchorage designed for the DBE loading, do not require an evaluation of the near-field earthquake (NFE) effects. However, safety class 1 acceleration sensitive equipment such as electrical relays must be evaluated for both NFE and DBE since they are known to malfunction when excited by high frequency seismic motions.

1457 (WHC-SD-TD-ER–004) **Usability testing of the human-machine interface for the Light Duty Utility Arm System.** Kiebel, G.R.; Ellis, J.E.; Masliah, M.R. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001564. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the usability testing that has been done for the control and data acquisition system for the Light Duty Utility Arm (LDUA) System. A program of usability testing has been established as a part of a process for making the LDUA as easy to use as possible. The LDUA System is being designed to deploy a family of tools, called End Effectors, into underground storage tanks by means of a robotic arm on the end of a telescoping mast, and to collect and manage the data that they generate. The LDUA System uses a vertical positioning mast, to lower the arm into a tank through an existing 30.5 cm access riser. A Mobile Deployment Subsystem is used to position the mast and arm over a tank riser for deployment, and to transport them from tank to tank. The LDUA System has many ancillary subsystems including the Operations Control Trailer, the Tank Riser Interface and Confinement Subsystem, the Decontamination Subsystem, and the End Effector Exchange Subsystem. This work resulted in the identification of several important improvements to the LDUA control and data acquisition system before the design was frozen. The most important of these were color coding of joints in motion, simultaneous operator control of multiple joints, and changes to the field-of-views of the camera lenses for the robot and other camera systems.

1458 (WHC-SD-W320-TC–002) **Project W-320 Heel Jet Secondary Catch Mechanism lateral load test.** Bellomy, J.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002089. Source: OSTI; NTIS; GPO Dep.

This test procedure establishes the requirements for performing a lateral load test of the Heel Jet Secondary Catch Mechanism (SCM). Successful performance of this test will demonstrate that the SCM is capable of performing as designed when subjected to a force applied normal to the longitudinal axis of the mechanism. This test procedure is prepared following the recommended format and content guidelines for test procedures as prescribed in WHC-IP-1026, Engineering Practice Guidelines, Appendix K, Test Plans, Specifications, Procedures and Reports.

1459 (WHC-SD-WM-ER–380) **Stress analysis of core sampler truck number 2 platform: 2,000 LBF crane lift capacity.** Ziada, H.H. Westinghouse Hanford Co., Richland, WA (United States). 4 Oct 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002370. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the structural analysis and evaluation of the platform of core sampler truck #2 for 2,000 lbf crane lift capacity.

1460 (WHC-SD-WM-SDD–049) **System design description for mini-dacs data acquisition and control system.** Vargo, F.G. Jr. (Westinghouse Hanford Co., Richland, WA (United States)); Trujillo, L.T.; Smith, S.O. Westinghouse Hanford Co., Richland, WA (United States). 30 Sep 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001556. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the hardware computer system, for the mini data acquisition and control system (DACS) that was fabricated by Los Alamos National Laboratory (LANL), to support the testing of the spare mixer pump for SY-101.

1461 (Y/DW–1341) **A modular dexterous robot for glove box applications.** Walker, E.W. Jr. (Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)); Igou, R.E.; Karlen, J.P.; Kowalski, K.A.; Eismann, P.H. Oak Ridge National Lab., TN (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. (CONF-9409211–5: American Institute of Aeronautics and Astronautics space programs and technologies conference and exhibit, Birmingham, AL (United States), 27 Sep 1994). Order Number DE95002057. Source: OSTI; NTIS; GPO Dep.

Many industrial processes today require the use of "glove boxes" — environmentally sealed chambers designed to allow access by human workers through ports fitted with protective gloves. A new technology for the automation of complex material-handling functions is described in this paper. The advantages of an agile robotic manipulator system being used in this application are discussed, including reduced life-cycle cost of automation, enhanced ability to respond to changes in process requirements, and improved reliability and maintainability. This paper also reviews lessons learned in applying an highly dexterous modular robot to a glove box environment, such as the evaluation of arm kinematics to achieve the required work envelope, system payload capacity, methods for automated tooling changes, tolerance of the arm mechanism and electronics to exposure to industrial chemicals and an argon atmosphere, the benefits of arm modularity for system maintenance, safety concerns, the integration of high-level control technology and off-line development of process motion sequences.

4204 Heat Transfer and Fluid Flow

Refer also to citation(s) 78, 707, 708, 857, 1425, 2406

1462 (CEA-CONF–11782) **A new paradigm for particle tracking velocimetry, based on graph-theory and pulsed neural network.** Derou, D.; Herault, L. CEA Centre d'Etudes de Grenoble, 38 (France). Lab. d'Electronique et d'Instrumentation. 1994. 7p. (CONF-9407149–: 7. International Symposium on Applications of Laser Techniques to Fluid Mechanics, Lisbonne (Portugal), 11 Jul 1994). Order Number DE95606390. Source: OSTI; NTIS (US Sales Only); INIS.

The Particle Tracking Velocimetry (PTV) technique works by recording, at different instances in time, positions of small tracers particles following a flow and illuminated by a sheet, or pseudo sheet, of light. It aims to recognize each particle trajectory, constituted of n different spots and determine thus each particle velocity vector. In this paper, we devise a new method, taking into account a global consistency of the trajectories to be extracted, in terms of visual perception and physical properties. It is based on a graph-theoretic formulation of the particle tracking problem and the use of an original neural network, called pulsed neural network. (authors). 4 figs.

1463 (CEA-CONF–11795) **Droplet size and velocity at the exit of a nozzle with two-component near critical and critical flow.** Lemonnier, H.; Camelo-Cavalcanti, E.S. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 8p. (CONF-930830–: National conference and exposition on heat transfer, Atlanta, GA (United States), 8-11 Aug 1993). Order Number DE95606391. Source: OSTI; NTIS (US Sales Only); INIS.

Two-component critical flow modelling is an important issue for safety studies of various hazardous industrial activities. When the flow quality is high, the critical flow rate prediction is sensitive to the modelling of gas droplet mixture interfacial area. In order to improve the description of these flows, experiments were conducted with air-water flows in converging nozzles. The pressure was 2 and 4 bar and the gas mass quality ranged between 100% and 20%. The droplets size and velocity have been measured close to the outlet section of a nozzle with a 10 mm diameter throat. Subcritical and critical conditions were observed. These data are compared with the predictions of a critical flow model which includes an interfacial area model based on the classical ideas of Hinze and Kolmogorov. (authors). 9 figs., 12 refs.

1464 (CEA-CONF–11834) **A better approach to the MDNBR concept.** Crecy, F. de. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 8p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606392. Source: OSTI; NTIS (US Sales Only); INIS.

This paper recalls the statistical origins of the MDNBR concept and Owen's coefficients, as used in CHF studies. The way in which they are currently used may be incorrect and we shall present a better approach, in which the lower tolerance interval limit depends on parameters. Use with least-square regressions and smoothing splines is explained. We also include an example, based on a CHF EPRI test, from the Columbia University data bank. (author). 1 fig., 6 refs.

1465 (CEA-CONF–11839) **Interfacial friction in low flowrate vertical annular flow.** Kelly, J.M.; Freitas, R.L. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 13p. (CONF-931005–: 6. international topical meeting on nuclear reactor thermal hydraulics, Grenoble (France), 5-8 Oct 1993). Order Number DE95606393. Source: OSTI; NTIS (US Sales Only); INIS.

During boil-off and reflood transients in nuclear reactors, the core liquid inventory and inlet flowrate are largely determined by the interfacial friction in the reactor core. For these transients, annular flow occurs at relatively modest liquid flowrates and at the low heat fluxes typical of decay heat conditions. The resulting low vapor Reynolds numbers, are out of the data range used to develop the generally accepted interfacial friction relations for annular flow. In addition, most existing annular flow data comes from air/liquid adiabatic experiments with fully developed flows. By contrast, in a reactor core, the flow is continuously developing along the heated length as the vapor flowrate increases and the flow regimes evolve from bubbly to annular flow. Indeed, the entire annular flow regime may exist only over tens of L/D's. Despite these limitations, many of the advanced reactor safety analysis codes employ the Wallis model for interfacial friction in annular flow. Our analyses of the conditions existing at the end-of-reflood in the PERICLES tests have indicated that the Wallis model seriously underestimates the interfacial shear for low vapor velocity cocurrent upflow. To extend the annular flow data base to diabatic low flowrate conditions, the DADINE tests were re-analyzed. In these tests, both pressure drop and local cross-section averaged void fractions were measured. Thus, both the wall and interfacial shear can be deduced. Based on the results of this analysis, a new correlation is proposed for interfacial friction in annular flow. (authors). 5 figs., 12 refs.

1466 (CONF-9404137–) **Proceedings of the Twelfth Symposium on Energy Engineering Sciences: Fluid/thermal systems and dynamics.** Argonne National Lab., IL (United States). [1994]. 298p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. From 12. symposium on energy engineering sciences; Argonne, IL (United States); 27-29 Apr 1994. Order Number DE94017694. Source: OSTI; NTIS; GPO Dep.

The central theme of this year's meeting was fluid/thermal systems and dynamics emphasizing modeling and experiments. This symposium was organized into nine technical sessions: physical systems dynamics; nonlinear dynamics and control I & II; multiphase flow; fluid/thermal systems I & II; robotics; combustion and plasma systems; and multi-phase and film flow. It is appropriate to restate here the goals and mission of the Engineering Research Program. The DOE Office of Basic Energy Sciences, of which Engineering Research is a component program, is responsible for the long-term mission-oriented research in the Department. It has the prime responsibility for establishing the basic scientific foundation upon which the Nation's future energy options will have to be identified, developed, and built; it is committed to the generation of new knowledge necessary for the solution of present and future problems of energy exploration, production, conversion, and utilization, consistent with respect for the environment. Individual papers are indexed separately on the database.

1467 (ETDE/DE-mf–95708707) **Measurement of two velocity components in the vicinity of the wall of a turbulent fluid flow by means of a Laser-Doppler-Anemometer submerged into the fluid.** Mitteilungen aus dem Max-Planck-Institut fuer Stroemungsforschung, v. 110. Thiele, B. Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany). 1993. 87p. (In German). Order Number DE95708707. Source: OSTI; NTIS (US Sales Only).

In the Goettingen oil channel in a fully developed turbulent flow the velocity components in streamwise direction and perpendicular to the wall were measured with the help of a newly constructed two component Laser-Doppler-Anemometer. The anemometer was especially adapted to the spatial conditions of the channel. Suitable scattering particles were synthesized for the oil used by a composition of titanium dioxide and polymerization glue. The mean value of both velocity components as well as the root mean square values, the skewness and flatness factors of the velocity fluctuations and the Reynolds shear stress were measured as a function of the wall distance. During the computation of the frequency distributions the so-called velocity bias - the difference between the real statistical moments and the moments determined with the help of a Laser-Doppler-Anemometer - was taken into consideration. The results obtained with this new Laser-Doppler-Anemometer are in a good agreement with the findings of other authors gained by numerical simulation. (orig.)

1468 (ETDE/DE-mf–95708708) **Non-intrusive measurement of temperature and velocity in free convection.** Mitteilungen aus dem Max-Planck-Institut fuer Stroemungsforschung, v. 108. Koch, S. Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany). 1993. 89p. (In German). Order Number DE95708708. Source: OSTI; NTIS (US Sales Only).

A technique for simultaneously measuring the temperature and velocity in liquid flows was developed. Small droplets of thermochromic liquid crystals, suspended in the liquid, serve as tracer particles. The colour of the light reflected by the crystals yields the temperature, while their velocity is measured via PIV from their displacement in a time interval. The measurement and evaluation are performed by digital image processing of colour video images. By shifting the plane of observation a three-dimensional flow field can be scanned. The technique was applied to the convective flow in a box with two differentially heated opposite side walls. Thwo cases were considered: the influence of the thermal boundary conditions on a stationary flow and the onset of convection in a fluid initially at rest imposing a temperature difference on the heated walls. The results were compared with numerical simulations. (orig.)

1469 (ETDE/DE-mf–95708760) **The formation of coatings on heat exchanger pipe bundles subjected to transverse flow.** Ruegge, J. Technische Univ. Braunschweig (Germany). Fakultaet fuer Maschinenbau und Elektrotechnik. 6 Feb 1992. 146p. (In German). Order Number DE95708760. Source: OSTI; NTIS (US Sales Only).

In contrast to work which examines the connection between the composition of the solid in the gas and the formation of coatings, this work tries to collect information on how the formation of coatings depends on the arrangement of the pipes. Fouling tests were carried out with different pipe bundles subjected to transverse flow, where the time course of formation of the coatings and the deposited layer were analysed. One also tried to determine how the coatings affect the gas flow in the pipe bundle. An investigation of the speeds, the turbulence and the pressure loss was necessary for this purpose. The effect which the formation of coatings has on heat transfer is of basic importance. Therefore, the processes in the deposition of particles on heat exchanger surfaces, which can

be described by a physical model, can be connected with those of heat transfer. Finally, the model should be verified by heat transfer measurements, which were made during the fouling tests. (orig.)

1470 (ETDE/DE-mf–95716173) **Laser Doppler anemometric measurement of two speed components in turbulent channel flow.** Max-Planck-Institut fuer Stroemungsforschung. Bericht, v. 6/1994. Klein, C. Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany). Apr 1994. 70p. (In German). Order Number DE95716173. Source: OSTI; NTIS (US Sales Only).

In this work, a two component laser Doppler anemometric measurement in turbulent channel flow is introduced and its results are discussed. Fully turbulent flow bounded by walls occurs in nature and in our industrial environment, which explains the interest in this form of flow. The existing geometry of this flow, due to the configuration bounded by walls, is very suitable for theoretical and experimental investigations. For this reason, these are many publications of experimental and theoretical results on turbulent channel flow, where there is no analytical solution of the non-steady state, in compressible Navier-Stokes equations on which this flow is based. The theoretical investigations are therefore limited to numerical simulation of the movement equations. (orig.)

1471 (ETDE/DE-mf–95716174) **Thermal convection with phase change: Experimental investigations and comparison with numerical results.** Max-Planck-Institut fuer Stroemungsforschung. Bericht, v. 5/1994. Abegg, C. Max-Planck-Institut fuer Stroemungsforschung, Goettingen (Germany). Apr 1994. 63p. (In German). Order Number DE95716174. Source: OSTI; NTIS (US Sales Only).

In this work, the thermal convection in a cubic cell was examined, where the top lid was cooled and the five lower walls were heated. To observe the flow field, a temperature measurement process with liquid crystals and PIV was used. Measurements were made for different Rayleigh numbers, one of them with phase change. The transient use, the steady state case of speed and temperature fields and track pictures were shown. These were compared with numerical calculations in which the thermal boundary conditions and the material parameters were able to be varied. (orig.)

1472 (ETDE/DE-mf–95716383) **Further development of the seven-hole probe technique for steady flow measurements: Final report.** Ederhof, A.; Lustenberger, P. ABB Kraftwerke AG, Mannheim (Germany). Abt. Gasturbinenentwicklung. Jan 1993. 30p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 036800D. Order Number DE95716383. Source: OSTI; NTIS (US Sales Only).

A well known method for calibration and data processing of seven-hole probes was investigated. It had been the target to optimize the method with respect to improved measurement accuracy. This was done by investigating modifications of calibration algorithms and processing of sector boundary data. Calibration data was obtained from a test probe. This was the basis for this investigation. The accuracy of the probe was improved in the entire domain by extending the calibration polynomial from degree 3 to degree 4. An additional improvement was obtained in the boundary region of the sections by generating artificial data points on the boundary. (orig.). 3 figs., 3 tabs., 9 refs.

1473 (ETDE/DE-mf–95716385) **DKV joint project: reduction of CFC-emissions in air conditioning and refrigeration. Subproject 6: Pool boiling of new refrigerants and their mixtures at single plain and finned tubes. Final report.** Gorenflo, D.; Rott, W.; Sokol, P.; Caplanis, S; Kuenstler, W. Paderborn Univ. (Gesamthochschule) (Germany). Lab. fuer Waerme- und Kaeltetechnik. Mar 1993. 22p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01ZH89F. Order Number DE95716385. Source: OSTI; NTIS (US Sales Only).

Heat transfer at pool boiling from three novel finned tubes with different fin geometry to the new refrigerants R134a ($CH_2F.CF_3$), R152a ($CH_3.CHF_2$), R227 ($CF_3.CHF.CF_3$) and to a nearly equimolar mixture of R134a and R152a has been investigated within extended ranges of heat flux and saturation pressure. The main new features of the tubes are: K-shaped fins with very narrow fin distances/T-shaped fins with additional grooves between the fins/Y-shaped fins with additional grooves between the fins. The results show that especially the tubes with T-shaped and Y-shaped fins are significantly superior to plain tubes at pool boiling of the new refrigerants at saturation pressures up to approximately 10 bar. The biggest enhancement has been achieved using the tube with Y-shaped fins, thus energy consumption can be reduced by smaller temperature differences on the pool side, if these tubes will be applied, and the amount of refrigerants as well as construction material for the evaporators can be reduced by more compact design, being possible, because the heat flow rate transferred per unit of tube length may be chosen higher. (orig.). 11 refs., 1 tab., 12 figs.

1474 (INIS-mf–14376, pp. 45) **Determination of mass transfer coefficient in two-phase bubby flow using laser-doppler anemometry.** Kassem, K.M.A. (Menia Univ. (Egypt)). Cape Coast Univ. (Ghana). Dept. of Physics. Aug 1994. 96p. Sponsored by International Centre for Theoretical Physics, Trieste (Italy). (CONF-9408186–: 3. International workshop on the physics and modern applications of lasers, Cape Coast (Ghana), 8-20 Aug 1994). In *The third international workshop on the physics and modern applications of lasers 8-20 August, 1994.* Order Number DE95606395. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication. MASS TRANSFER/laser doppler anemometers; MASS TRANSFER/two-phase flow; BUBBLES

1475 (LA-UR–94-3449) **Status of CFDLIB performance tests on the T3D.** Padial, N.T. (Los Alamos National Lab., NM (United States). Theoretical Div.); Kashiwa, B.A.; Kothe, D.B. Los Alamos National Lab., NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410212–3: Cray user's group conference, Tours (France), 10-14 Oct 1994). Order Number DE95002708. Source: OSTI; NTIS; GPO Dep.

CFDLIB is a collection of two- and three-dimensional computer codes for problems in computational fluid dynamics. The library handles a wide range of flow regimes both single and multiphase, from fully incompressible to hypersonic, chemically reacting or inert materials. The method uses the Implicity Continuous-fluid Eulerian scheme (ICE) which becomes essentially identical to the Marker and Cell (MAC) method in the incompressible limit. The method, a Finite-Volume scheme, with cell-centered state variables, utilizes an Arbitrary-Lagrangian-Eulerian (ALE) split computational cycle in the sense that the mesh is allowed to move in an arbitrary fashion. In addition, CFDLIB employs a multiblock data structure that proved extremely convenient for implementation on parallel computers. CFDLIB is now available in sequential or parallel environments, is written in standard FORTRAN 77, and is highly portable. Results are given for a selection of specialized applications that illustrate the kind of problems of interest to CFDLIB users. Finally, initial results are given for performance studies comparing the Cray Y-MP, T3D, and an IBM workstation cluster. For certain problems, a Y-MP-equivalent real solution time is achieved with less than eight processors on the T3D.

1476 (LA-UR–94-3611) **Accurate solution algorithms for incompressible multiphase flows.** Rider, W.J. (Los Alamos National Lab., NM (United States)); Kothe, D.B.; Mosso, S.J.; Cerutti, J.H.; Hochstein, J.I. Los Alamos National Lab., NM (United States). 19 Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940152–3: 32. aerospace sciences meeting and exhibit, Reno, NV (United States), 11-14 Jan 1994). Order Number DE95002727. Source: OSTI; NTIS; INIS; GPO Dep.

A number of advances in modeling multiphase incompressible flow are described. These advances include high-order Godunov projection methods, piecewise linear interface reconstruction and tracking and the continuum surface force model. Examples are given.

1477 (SAND–94-1173) **COYOTE II - a finite element computer program for nonlinear heat conduction problems: Part I - theoretical background.** Gartling, D.K.; Hogan, R.E. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC04-94AL85000. Order Number DE95002587. Source: OSTI; NTIS; GPO Dep.

The theoretical and numerical background for the finite element computer program, COYOTE II, is presented in detail. COYOTE II is designed for the multi-dimensional analysis of nonlinear heat conduction problems and other types of diffusion problems. A general description of the boundary value problems treated by the program is presented. The finite element formulation and the associated numerical methods used in COYOTE II are also outlined. Instructions for use of the code are documented in SAND94-1179; examples of problems analyzed with the code are provided in SAND94-1180.

4205 Materials Testing

Refer also to citation(s) 607, 810, 1033, 1497, 1500, 1625, 2026, 2434

1478 (ANL/ET/CP–82313) **High-temperature ultrasonic characterization of Ag-clad superconductor tapes.** Lanagan, M.T.; Kupperman, D.S.; Yaconi, G.A.; Kilgore, S.H. Argonne National Lab., IL (United States). Mathematics and Computer Science Div. 30 Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941013–6: Applied superconductivity conference, Boston, MA (United States), 16-21 Oct 1994). Order Number DE95002909. Source: OSTI; NTIS; GPO Dep.

An ultrasonic nondestructive evaluation technique was developed to monitor liquid-phase evolution during heat treatment of high-$T_c$superconductors. The liquid phase is important for microstructural and phase development of superconductors and is important in fabricating conductors with high critical current density, J_c. Tapes were fabricated by a powder-in-tube process and then placed in a controlled atmosphere furnace. During the heat treatment process, a magnetostrictive transducer launches a 140-kHz wave into the sample, and relative change in acoustic velocity is measured. A significant decrease in the velocity was seen at the incongruent melting temperatures of Bi-based superconductors. In addition, Ag-clad tapes with Al_2O_3 and NaCl cores were used to validate the measurement technique. Advantages of this technique over other thermal analysis methods include in-situ analysis of the final tape form, monitoring of isothermal liquid evolution, and control of volatile species such as Tl and Pb.

1479 (AREAEE–282) **High temperature high vacuum creep testing facilities.** Matta, M.K. Nuclear Research Centre, Inshas (Egypt). 1985. 32p. Order Number DE95603850. Source: OSTI; NTIS (US Sales Only); INIS.

Creep is the term used to describe time-dependent plastic flow of metals under conditions of constant load or stress at constant high temperature. Creep has an important considerations for materials operating under stresses at high temperatures for long time such as cladding materials, pressure vessels, steam turbines, boilers,...etc. These two creep machines measures the creep of materials and alloys at high temperature under high vacuum at constant stress. By the two chart recorders attached to the system one could register time and temperature versus strain during the test . This report consists of three chapters, chapter I is the introduction, chapter II is the technical description of the creep machines while chapter III discuss some experimental data on the creep behaviour. Of helium implanted stainless steel. 13 fig., 3 tab.

1480 (AREAEE–286) **Electronic stability and reproducible accuracy of HARSHAW 2000(A,B) TLD-analyzer.** Yossef, S.K.; Henaish, B.A. Nuclear Research Centre, Inshas (Egypt). 1985. 37p. Order Number DE95606433. Source: OSTI; NTIS (US Sales Only); INIS.

Nowadays, the thermoluminescence techniques utilizing natural materials and assorted chemical compound of various geometrical configurations are widely and popularly used on the international scale as a dose evaluation system. The main problems which are usually encounting the accuracy of the evaluated dose by means of such various dosimeter forms are the long and short term stability of the measuring system. Also this manuscript is a very essential details stated out the principle mechanisms which cause that produced TL-readers instability. As it is stated out through the different sections of this issue, it is mainly due to the interior mechanisms of the TLD measuring systems. Further more, the various detailed discussions availed through the different sections of such issue are mainly accompanied by long term experiences gained by the authors. A novel heating cycle mechanism applied to HARSHOW 2000(A and b) TLD analyzer is tested experimentally. Also long and short term stability beside the reproducibility of the TLD reader system were experimentally tested under various seasonable environmental thermal conditions. The results of experimental measurements were noted for a total duration of six months during continuous operation of the TLD reader for one year. 1 fig., 3 tab.

1481 (CEA-CONF–11794) **Modular bench for non destructive controls.** Cruz, D.; Malgouyres, P.; Confort, E.; Allard, P. CEA Centre d'Etudes de Grenoble, 38 (France). Dept. de Thermohydraulique et de Physique. 1993. 89p. (In French). (CONF-9306384–: ECC workgroup meeting on hot cells, Chinon (France), 15-16 Jun 1993). Order Number DE95606434. Source: OSTI; NTIS (US Sales Only); INIS.

In this text we give the technologic composition and the functions of this new modular polyvalent bench used for PWR fuel rods examination. figs., annexes.

1482 (DOE/ER/13797–T1) **High-frequency acoustic sensors for operation in a gaseous medium: Final report.** Kino, G.S. Stanford Univ., CA (United States). Edward L. Ginzton Lab. [1990]. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-87ER13797. (GL–4979). Order Number DE95002123. Source: OSTI; NTIS; GPO Dep.

Photothermal microscopy is a technique for measuring thermal properties on a small scale by using focused laser beams as heat sources and as temperature probes. Typically used for nondestructive evaluation (NDE) of materials, its main advantage is its ability to measure types of flaws that are not visible optically or acoustically. Because of the optical nature of photothermal microscopy, sub-micron resolutions can be obtained in many of these thermal measurements. The greatest limitation of these systems is their relatively poor signal-to-noise ratios and, consequently, slow imaging speeds. To circumvent this problem, a variety of approaches to the detection of thermal waves has been pursued in recent years. This thesis compares the relative merits of a common class of techniques that rely on direct observation of physical changes in the heated sample, including a novel approach to interferometric measurement of the thermal expansion. It is found that the optimum approach depends not only on the physical properties of the sample being studies, but also upon the resolution of the experiment and the damage threshold of the specimen. Finally, this dissertation describes the applications of photothermal microscopy to the study of the anisotropic thermal properties of the new high-$T_c$superconductors. By adding a high-vacuum cryostat to the microscope, the authors have been able to study the influence of the superconducting transition on the thermal conductivity. The measurements of the anisotropic thermal conductivity demonstrate that the heat flow along the superconducting planes is enhanced below the transition, and that no such enhancement exists in the non-superconducting direction. Material examined was Bi-Ca-Sr-Cu-O.

1483 (INIS-GB–643) **Industrial radiography.** Ionising Radiation Protection Series, no.1. Health and Safety Executive, London (United Kingdom). Feb 1994. 2p. Order Number DE95606437. Source: OSTI; NTIS (US Sales Only); INIS.

This Health and Safety Executive Information Sheet on industrial radiography aims to inform directors and managers of industrial radiography companies on the safety precautions necessary to ensure that their personnel do not exceed dose guidelines for exposure to ionizing radiation. The Ionising Radiations Regulations 1985 (IRR85) require that exposure doses for radiographers are kept as low reasonably practicable. Equipment maintenance, and the employment of proper emergency procedures will help to ensure personnel safety. (UK).

1484 (INIS-mf–14393, pp. 75-76) **Studies on the structure and properties of steel and ceramics surfaces modified by high intensity pulsed ion beams.** Ciurapinski, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Kominek, J.; Walis,

L.; Piekoszewski, J.; Langner, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 4 refs., 2 figs. MATERIALS TESTING/ceramics; MATERIALS TESTING/ion beams; MATERIALS TESTING/steels; IRRADIATION; CERAMICS; STEELS; METALLOGRAPHY; SURFACE HARDENING

1485 (INIS-mf–14393, pp. 78-79) **Application of track autoradiography to determination of nitrogen distribution in surface layers of steels subjected to LPCVD and PVD processes and thermo-chemical treatment.** Ciurapinski, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Walis, L.; Firganek, H. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 1 fig. AUTORADIOGRAPHY/steels; MATERIALS TESTING/steels; MATERIALS TESTING/surface treatments; AUTORADIOGRAPHY; STEELS; CARBON 14; NEUTRON REACTIONS; NITROGEN ADDITIONS; NITROGEN 14 TARGET; PARTICLE TRACKS; PROTONS

1486 (INIS-mf–14393, pp. 83-84) **Particle track membranes (PTM) examinations by small-angle X-ray scattering.** Ciesla, K. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Buczkowski, M.; Mogilevsky, L.Yu. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 3 figs. MATERIALS TESTING/x-ray diffraction; MEMBRANES/materials testing; FOILS; MEMBRANES; PARTICLE TRACKS; PHYSICAL PROPERTIES; POLYESTERS; POROSITY

1487 (LA–12848-MS) **Electrical-conductivity testing of latex gloves.** Stampfer, J.F.; Salazar, J.A.; Trujillo, A.G.; Harris, T.; Berardinelli, S.P. Los Alamos National Lab., NM (United States). [1994]. 39p. Sponsored by National Inst. for Occupational Safety and Health, Rockville, MD (United States). DOE Contract W-7405-ENG-36. Order Number DE95002456. Source: OSTI; NTIS; GPO Dep.

There is an increasing awareness in the healthcare field that gloves worn for protection from hazards associated with body fluids do not always afford the protection desired. Gloves may have defects, such as holes, as they come from the manufacturer or distributor, or they may become defective during storage or use. While the numbers vary widely, failure rates for new gloves, defined as detectable holes in gloves prior to use, for unused examination gloves are reported as high as 58%. Rates as high as 7% have been reported for sterile latex gloves. Incidences of breaching the latex barrier during use vary with procedure but have been reported as high as 50%. In recent years, a number of devices have been developed to detect holes in latex gloves as they are being worn. Detection of increased electrical conductivity that takes place through the holes in the gloves is used to activate an audible alarm. The primary purpose of this research was to investigate the validity of this method for hole detection. This evaluation was accomplished with both basic laboratory equipment and commercially available instruments. We did not evaluate or critically compare the individual devices. We also investigated the use of electrical conductivity as a quality assurance (QA) procedure, and the degradation of latex gloves due to storage and exposure to laboratory atmospheres and disinfectants.

1488 (ORNL/TM–12826) **Atom probe field ion microscopy and related topics: A bibliography 1993.** Godfrey, R.D.; Miller, M.K.; Russell, K.F. Oak Ridge National Lab., TN (United States). Oct 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002489. Source: OSTI; NTIS; INIS; GPO Dep.

This bibliography, covering the period 1993, includes references related to the following topics: atom probe field ion microscopy (APFIM), field emission (FE), and field ion microscopy (FIM). Technique-oriented studies and applications are included. The references contained in this document were compiled from a variety of sources including computer searches and personal lists of publications. To reduce the length of this document, the references have been reduced to the minimum necessary to locate the articles. The references are listed alphabetically by authors, an Addendum of references missed in previous bibliographies is included.

1489 (Y/DW–1332) **Operator's manual for the multistation offgas analysis system.** Hayes, A.B.; Basford, J.A. Oak Ridge National Lab., TN (United States). 10 Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE95002060. Source: OSTI; NTIS; GPO Dep.

The Multistation Offgas Analysis System (MOAS) is a fully automated instrument which can independently measure the gases emitted by up to four samples in containers heated in ovens. A mass spectrometer is used to determine accurately their flow rates. There are six interconnected high vacuum pumping stations, one for each of the sample containers, one for the mass spectrometer, and one for the calibrated leaks which are used to calibrate the mass spectrometer. Quadstar 421™ is the software package marketed by Balzers, the manufacturer of the mass spectrometer. This software used by MOAS is a combination of Quadstar 421™, special routines, called sequences in the Balzers nomenclature, and compiled programs that controls MOAS. Tests are run repeatedly on each of the four oven stations, while stations that are not ready, or do not have a sample are skipped. While the computer is sitting idle between tests, the software monitors the vacuum system. If necessary, the software will shut down a pumping station that is not operating correctly. The status of pumping stations and tests, filenames for data and oven temperatures are stored on disk, so the software can recover from a power failure. The operator can use the software to start or stop testing, load parts, perform calibrations as necessary, and start up or shut down pumping stations. The software aids in routine functions, such as changing an ion gauge, by performing the required valve actuations automatically, and checking the pressure readings and turbopump speeds as necessary. The computer takes mass spectrometer sensitivity calibration data automatically, every week at 12:00AM on Sunday. An operator does not need to be present for these calibrations. The calibration data are saved and may be used or deleted by the operator at a later date.

4210 Combustion Systems

Refer also to citation(s) 81, 87, 729, 1177

1490 (DOE/MT/92021–7) **Analysis/control of in-bed tube erosion phenomena in the fluidized bed combustion (FBC) system.** Lee, S.W. Morgan State Univ., Baltimore, MD (United States). School of Engineering. Jul 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92MT92021. Order Number DE95002768. Source: OSTI; NTIS; GPO Dep.

This technical report summarizes the research work performed and progress achieved during the period of April 1, 1994 to June 30, 1994. The metal wastage tests were continued to understand the erosion phenomena of in-bed tube in FBC system. The plain carbon steel, AISI 1018 was used as the target materials along with quartz silica (SiO_2) as the erodent particles. For the high velocity test, the short exposure time (4 hours) minimized the oxide scale formation and potential weight gain. No oxidation layer could be seen on worn surfaces. The eroded surface of specimens tested under high particle velocity exhibited the typical ductile mode. The maximum material wastage was occurred at 45° of impact angle. The metal wastage rate of AISI 1018 carbon steel demonstrated higher wastage at a shallow angle than at a step angle with a maximum erosion rate occurring at impact angle of 45°. The morphologies of the specimens were examined and analyzed by scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS).

1491 (DOE/MT/93006–3) **Investigation of heat transfer and combustion in the advanced Fluidized Bed Combustor (FBC): Technical progress report No. 3, April 1, 1994–June 30, 1994.** Lee, S.W. Morgan State Univ., Baltimore, MD (United States). School of Engineering. Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-93MT93006. Order Number DE95002767. Source: OSTI; NTIS; GPO Dep.

The flow measuring system was arranged with the auxiliary system to measure the air velocity and flow rate. The characteristic curves of the primary air velocity/flow rate were predicted. A 3-dimensional directional probe with four manometers was arranged to measure the local air velocities. The calibration of the static was conducted and predicted for the different pitch angles. The progress of this project has been on schedule. The gas flow measurement will be continued in the cold test model.

1492 (DOE/OR/21400–94/C0354) **Ceramic fiber ceramic matrix filter development.** Judkins, R.R. (Oak Ridge National Lab., TN (United States)); Stinton, D.P.; Smith, R.G.; Fischer, E.M. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-9406131–2: Coal-fired power systems: advances in IGCC and PFBC review meeting, Morgantown, WV (United States), 21-23 Jun 1994). Order Number DE94018113. Source: OSTI; NTIS; GPO Dep.

The objectives of this project were to develop a novel type of candle filter based on a ceramic fiber-ceramic matrix composite material, and to extend the development to full-size, 60-mm OD by 1-meter-long candle filters. The goal is to develop a ceramic filter suitable for use in a variety of fossil energy system environments such as integrated coal gasification combined cycles (IGCC), pressurized fluidized-bed combustion (PFBC), and other advanced coal combustion environments. Further, the ceramic fiber ceramic matrix composite filter, hereinafter referred to as the ceramic composite filter, was to be inherently crack resistant, a property not found in conventional monolithic ceramic candle filters, such as those fabricated from clay-bonded silicon carbide. Finally, the adequacy of the filters in the fossil energy system environments is to be proven through simulated and in-plant tests.

1493 (DOE/PC/92152–T11) **The physics of non-Newtonian liquid slurry atomization: Second quarterly technical report, April 1, 1994–June 31, 1994.** Mansour, A.; Chigier, N. Carnegie-Mellon Univ., Pittsburgh, PA (United States). Dept. of Mechanical Engineering. [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG22-92PC92152. Order Number DE95001945. Source: OSTI; NTIS; GPO Dep.

This study shows that for water injection into stagnant air, the stability curve is bounded by a laminar portion characterized by a very low initial disturbance amplitude ($1n(a/\delta_{o,L}) = 22$), where a is the jet radius and δ_0 is the initial disturbance amplitude, and a fully developed turbulent portion characterized by a very high initial disturbance amplitude ($1n(a/\delta_{o,T}) \sim 4.85$). In the transition region, $1n(a/\delta_o)$ is not single valued; it decreases with increasing Reynolds number. It was also found that, in the absence of aerodynamic effects, turbulent jets are as stable as laminar jets. For this mode of breakup the sole effect of turbulence is to propagate initial disturbances with amplitudes that are orders of magnitude larger than those of laminar jets ($\delta_{0,T} = 28 \times 10^6\ \delta_{o,L}$).

1494 (ETDE/DE-mf–95716027) **Fuzzy modelling of a gas furnace.** Universitaet Duisburg Gesamthochschule, Fachgebiet Mess-, Steuer- und Regelungstechnik. Forschungsbericht, v. 7/93. Kuepper, K. Duisburg Univ. (Gesamthochschule) (Germany). Fachgebiet 8 - Mess-, Steuer- und Regelungstechnik. 1993. 21p. (In German). Order Number DE95716027. Source: OSTI; NTIS (US Sales Only).

The report compares an algorithm for identifying fuzzy models developed by the Department of Measurement and Control Engineering with algorithms known from literature. The data used were originally published by Box and Jenkins (1970). So far, the results of the further developed algorithms have been promising. In addition, theoretical investigations are presented which simplify the algorithm and can be used with certain types of fuzzy controllers. (orig.)

4220 Mining and Underground Engineering

Refer also to citation(s) 1677

1495 (LBL–36312) **Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas.** Wang, H.F. (Univ. of Wisconsin, Madison, WI (United States)); Myer, L.R. Lawrence Berkeley Lab., CA (United States). 31 Oct 1994. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002654. Source: OSTI; NTIS; INIS; GPO Dep.

The subsurface environment is an important national resource that is utilized for construction, waste disposal and groundwater supply. Conflicting and unwise use has led to problems of groundwater contamination. Cleanup is often difficult and expensive, and perhaps not even possible in many cases. Construction projects often encounter unanticipated difficulties that increase expenses. Many of the difficulties of predicting mechanical behavior and fluid flow and transport behavior stem from problems in characterizing what cannot be seen. An underground research laboratory, such as can be developed in the nearly 14 miles of tunnel at the Superconducting Super Collider (SSC) site, will provide a unique opportunity to advance scientific investigations of fluid flow, chemical transport, and mechanical behavior in situ in weak and fractured, porous rock on a scale relevant to civil and environmental engineering applications involving the subsurface down to a depth of 100 m. The unique element provided by underground studies at the SSC site is three-dimensional access to a range of fracture conditions in two rock types, chalk and shale. Detailed experimentation can be carried out in small sections of the SSC tunnel where different types of fractures and faults occur and where different rock types or contacts are exposed. The entire length of the tunnel can serve as an observatory for large scale mechanical and fluid flow testing. The most exciting opportunity is to mine back a volume of rock to conduct a post-experiment audit following injection of a number of reactive and conservative tracers. Flow paths and tracer distributions can be examined directly. The scientific goal is to test conceptual models and numerical predictions. In addition, mechanical and hydrological data may be of significant value in developing safe and effective methods for closing the tunnel itself.

1496 (WHC-SD-EN-TRP–007) **Phase I ResonantSonic CRADA report.** Richterich, L.R. (Westinghouse Hanford Co., Richland, WA (United States)); Amos, L.O.; Fancher, J.D.; McLellan, G.W.; Setzer, W.V.; Tuttle, B.G.; Hockey, R.L.; Ferris, R.H.; Riechers, D.M.; Pitman, S.G. Westinghouse Hanford Co., Richland, WA (United States); Pacific Northwest Lab., Richland, WA (United States). 28 Mar 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE95001463. Source: OSTI; NTIS; INIS; GPO Dep.

This test report describes the Phase 1 testing and results of the ResonantSonic drilling method. This effort was conducted as part of a Cooperative Research and Development Agreement (CRADA) between the US Department of Energy, Pacific Northwest Laboratory, Westinghouse Hanford Company and Water Development Corporation. The purpose of this demonstration was to evaluate the Water Development Corporation's ResonantSonic drilling system, modify components as necessary and determine compatible drilling applications for the ResonantSonic drilling method for use at facilities in the DOE complex and private industry. Initially, the ResonantSonic drill was used to drill several test holes at the Drilling Technology Test Site to assess the feasibility of drilling vertical and angle holes. After this initial phase, a 45 degree angle vapor extraction well was drilled to a depth of 168 feet at the 200 West Carbon Tetrachloride Site. This well was drilled and completed in nine days. Extensive geologic and vapor sampling were conducted while drilling this well. In addition, testing was also conducted at the test site to evaluated drilling with larger diameter casing (8 5/8 inch). Evaluation of the Resonant Sonic drilling method will be continued during the Phase 2 portion of testing to determine if improvements to the ResonantSonic system will make it a more viable method for drilling and sampling.

4260 Components, Electron Devices and Circuits

Refer also to citation(s) 1004, 1080, 1137, 1246, 1516, 1542, 1668, 2279, 2555, 2557

1497 (CONF-880760–13) **Three-dimensional image processing for acoustic microscopy.** Reinholdtsen, P.; Khuri-Yakub, B.T. Stanford Univ., CA (United States). Edward L. Ginzton Lab.

Sep 1988. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-84ER45157. From 15. annual review of progress in quantitative nondestructive evaluation; La Jolla, CA (United States); 31 Jul - 5 aug 1988. Order Number DE95002124. Source: OSTI; NTIS; GPO Dep.

The authors have built a scanning acoustic microscope operating in the 3–10 MHz range that measures both amplitude and phase. They have demonstrated numerical enhancement of the transverse and depth resolution of the microscope. The transverse resolution is increased by approximately 20% and the depth resolution is doubled. The authors have applied this technique to measuring the profile of deep trenches (2 mm wide by 5 mm deep) which were designed as scale models of integrated circuit capacitors (2.5 μm wide by 6μm deep). These techniques could be used to characterized integrated circuits with an acoustic microscope operating at higher frequencies or with an optical microscope that measures amplitude and phase. In previous papers, the authors have demonstrated numerical enhancement of the transverse resolution of the acoustic microscope for quasi-planer objects. Many objects of interest have an elaborate structure in three dimensions. Consequently, one needs to generalize the theory of image formation. Most of the concepts presented previously have direct counterparts when scanning in three dimensions as compared to two. A method that combines images formed at slightly different frequencies gives even better depth resolution.

1498 (CONF-9310209–2) **Plasma processing for integrated circuits.** Berry, L.A. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1993 Fusion Power Associates annual meeting; Oak Ridge, TN (United States); 4-6 Oct 1993. Order Number DE95001419. Source: OSTI; NTIS; GPO Dep.

The steady advance of integrated circuit technology is one of the most remarkable technology trends in this era of technological revolution. For example, the 64-k memory chips of the early 1980s are now being replaced by 4-M and even 16-M chips. This trend is expected to continue with chips at the giga-bit level being available in a decade. The needs for ultraviolet and then X-ray lithography to define the submicron features needed for these larger, denser chips have been widely discussed. However, in parallel, the equipment (referred to as tools in the industry) and related processes to carry out the deposition and etching steps needed to actually produce devices in the tenth-micron range also require significant development. This paper summarizes present and anticipated contributions of magnetic fusion plasma theory and diagnostics and plasma production technology at Oak Ridge National Laboratory (ORNL) for the development of integrated circuit production technology. The discussion is introduced with a review of past technology evolution and of the present economic context for manufacturing.

1499 (ETDE/DE-mf–95716344) **Low-temperature small refrigerating machinery and cryotechnical devices for the future use of high-temperature superconductors: Final report.** Binneberg, A. (comp.); Buschmann, H. (comp.). Institut fuer Luft- und Kaeltetechnik GmbH, Dresden (Germany). [1990]. 27p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 30L2044B. Order Number DE95716344. Source: OSTI; NTIS (US Sales Only).

Superconductors-semiconductor electronic systems will only be successful if efficient and reliable small refrigerating machinery exists. Starting from the conditions of cryotechnics fields of application and trends of small refrigerating machinery are gone into. For refrigerating capacities up to 2 W cold gas machines working according to the Stirling principle can be used. For capacities up to 50 W Giffort-Mc-Mahon refrigerating machinery is used for which the here presented thermodynamic process is important. Finally some requirements and problems are gone into. At present the insufficient longevity of the refrigerating technique compared to the objects to be cooled presents a development problem. Another probem is the optimum thermal interconnection and the sufficient separation of disturbances. (BWI). 3 figs.

1500 (KCP–613-5388) **Survivability of soldered leadless chip carriers after temperature cycling.** Zawicki, L.R.; Lenhardt, B.W.; Smith, F.R. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. (CONF-941199–3: Meeting on the revolution in microelectronics, Boston, MA (United States), 15-17 Nov 1994). Order Number DE95001497. Source: OSTI; NTIS; GPO Dep.

Temperature cycling evaluations were conducted on leadless chip carriers (LCCs) soldered to thick film networks (TKNs). Various temperature ranges, rates of change, cycle times, number of cycles, and sizes of LCCs were used. The TKNs were attached to metal backing plates with 63Sn/37Pb solder preforms using an infrared vacuum soldering process. The LCCs were attached to Pt/Au TKNs with 63Sn/37Pb solder paste using a belt reflow process. Visual examination and cross-sectional analysis were used to evaluate the survivability. Results were also correlated with finite elemental analysis. Considering the initial results, possible solutions included changing the solder from 63Sn/37Pb to 50Pb/50In, deleting the metal backplate, changing the rate of change in the temperature cycle, and/or adding leads to the large LCCs. Because of a system requirement, the rate of change in the temperature cycle could not be changed. Since there was no long term reliability information on the Pt/Au TKN with 50Pb/50In solder, this option was also dropped. Additional evaluations showed little difference in the survivability of large LCC solder joints with or without the metal backing plate. The final results indicated that LCCs beyond a certain physical size required compliant leads to survive the temperature cycle requirements.

1501 (KCP–613-5432) **Plastic encapsulated parts.** Castillo, T. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Oct 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE95001876. Source: OSTI; NTIS; GPO Dep.

Plastic semiconductor packages were characterized as possible alternatives for canned devices, which are susceptible to internal shorts caused by conductive particles. Highly accelerated stress testing (HAST) as well as electrical and mechanical testing were conducted on plastic technology devices.

1502 (LA-SUB–94-132) **Final report for design and development SAWAFE peak detector chip.** Los Alamos National Lab., NM (United States); InnovASIC, Inc., Albuquerque, NM (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001745. Source: OSTI; NTIS; GPO Dep.

InnovASIC, Inc. was placed under contract by Los Alamos National Laboratories to specify, design, and have fabricated an Application Specific Integrated Circuit for the SAWAFE program. The design was completed, and an initial fabrication run was made. The ASIC vendor, under subcontract to InnovASIC, had an error in the initial build of the chip. An investigation of the problem is now under way. A second build is expected to be completed in June.

1503 (LA-UR–94-3057) **An investigation of the chemical and physical properties of pristine, electrochromically damaged, and photochromically damaged $KTiOPO_4$ (KTP) using surface analytical and optical spectroscopic techniques.** Quagliano, J.R. (Los Alamos National Lab., NM (United States)); Petrin, R.R.; Trujillo, T.C.; Cockroft, N.J.; Paffett, M.T.; Havrilla, G.; Maggiore, C.J.; Jacco, J.C. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950101–2: Advanced solid-state laser conference, Memphis, TN (United States), 29 Jan - 1 feb 1995). Order Number DE95000854. Source: OSTI; NTIS; GPO Dep.

Single-crystal $KTiOPO_4$ (KTP) is widely used as a nonlinear optical material in optics and lasers, but it can suffer irreversible damage from intense electric and electromagnetic fields; impurities, defects, vacancies, and electron/hole transfers are probably involved. This report shows results of surface and near-surface (bulk) studies using SIMS, Rutherford backscattering, PIXE, channeling, and XRF. The electrochromic damage may occur upon reduction of Ti^{4+} to Ti^{3+} by trapping electrons passing through the ion channels. Jahn-Teller distortions and Ti^{3+} absorption could produce the dark macroscopi damage. The claim that Ag ions could travel through the ion channels, is discounted by the RBS and SIMS data. RBS

does suggest Ti ion migration, but this is not likely, according to the KTP structure and lack of Ti ion enhancement in the white residue. The 355 nm radiation could be absorbed into the UV band edge to inititate a photochemical process (gray tracking), which could be the charge transfer from the oxide ligand to Ti^{4+} to create Ti^{3+}.

1504 (SAND–93-1531) **Characteristics and development report for the MC3994 and MC3994A relays.** Nance, W.R.; Young, J.P.; Wrobel, D.P. Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002952. Source: OSTI; NTIS; GPO Dep.

This report gives a brief description of the development activities for the MC3994 and MC3994A relays, including their mechanical and electrical characteristics. The basic details of the design were presented in SAND85-1288, "Characteristics and Development Report for the MC3593 and MC3594 Relays." This report also summarizes test results and describes the tests that were performed to ensure that the MC3994 and MC3994A had adequate design margin in accordance with the capability drawing requirements.

1505 (SAND–94-1302C) **Complementary GaAs junction-gated heterostructure field effect transistor technology.** Baca, A.G.; Zolper, J.C.; Sherwin, M.E.; Robertson, P.J.; Shul, R.J.; Howard, A.J.; Rieger, D.J.; Klem, J.F. Sandia National Labs., Albuquerque, NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410195–1: GaAs symposium, Philadelphia, PA (United States), 16-19 Oct 1994). Order Number DE94018901. Source: OSTI; NTIS; GPO Dep.

The first circuit results for a new GaAs complementary logic technology are presented. The technology allows for independently optimizable p- and n- channel transistors with junction gates. Excellent loaded gate delays of 179 ps at 1.2 V and 319 ps at 0.8 V have been demonstrated at low power supply voltages. A power-delay product of 8.9 fJ was obtained at 0.8 V.

1506 (SAND–94-1978C) **Reactor pumped laser research at the Sandia National Laboratories pulsed reactor facilities.** Bodette, D.E. (Sandia National Labs., Albuquerque, NM (United States)); Neal, D.R.; McArthur, D.A.; Pickard, P.S.; Hebner, G.; Michie, R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941102–31: Winter meeting of the American Nuclear Society, Washington, DC (United States), 13-18 Nov 1994). Order Number DE95002181. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Labs has been investigating concepts for high power lasers pumped directly by fission energy. The direct pumping of laser media with fission fragments offers the potential advantages of scaling to high powers and very long run times in a compact, self powered system. To investigate the potential of this concept, extensive experiments have been conducted in the Annular Core Research Reactor (ACRR) and the Sandia Pulsed Reactor (SPR-III). These experiments include laser physics tests, radiation effects tests on optical materials, and experiments to examine the scaling of reactor pumped lasers to high powers. The SPR-III is a U-10%Mo fast burst reactor which is used for laser physics experiments. SPR-III is capable of 70 to 1500 μs FWHM pulses generating up to several kW/cc excitation in a liter size laser cavity. The pulse widths greater than a few hundred microseconds are achieved using a pulse stretcher consisting of gram amounts of fissile material surrounded by moderator. The ACRR is a UO_2BeO fueled epithermal reactor which is used for larger volume scaling and beam quality experiments. ACRR operates in both steady state and pulsed modes with pulse widths of 7 to 250 ms resulting in excitation rates of ~2 to 100 W/cc in excitation volumes of up to 50 1. Experimental configurations on both reactors have included central cavity and external cavity locations. The experiments on SPR-III have defined optimum conditions for efficient reactor pumping of rare gas lasers. This information has been used to define scaling experiments now in progress in the ACRR.

1507 (SAND–94-2201C) **Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs.** Howard, A.J. (Sandia National Labs., Albuquerque, NM (United States)); Lovejoy, M.L.; Zavadil, K.R.; Rieger, D.J.; Shul, R.J.; Zolper, J.C.; Barnes, P.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9411132–1: Topical conference on the synthesis and processing of electronic materials, San Francisco, CA (United States), 13-18 Nov 1994). Order Number DE95000738. Source: OSTI; NTIS; GPO Dep.

Novel material systems such as ZnS_ySe_{1-y} and $Zn_xCd_{1-x}Te$ that are commonly grown at low temperatures (~300 C), require unique, low temperature processing schemes. For example, ohmic contact formation with the common AuGeNi n-GaAs contact is not appropriate for this application due to its relatively high anneal temperature (~400 C). For this reason, we investigated the effects of anneal temperature (150 to 400 C) and time (5 to 30 min) on the contact resistivity of PdGe to n-GaAs substrates. The contact surface morphology was measured by AFM and the material composition profile was analyzed by XPS. The characteristics of the PdGe contact are compared to the standard AuGeNi n-GaAs contact.

1508 (SAND–94-2469C) **Applications for reactor-pumped lasers.** Lipinski, R.J. (Sandia National Labs., Albuquerque, NM (United States). Nuclear Systems Research); McArthur, D.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409225–2: Physics of nuclear induced plasmas and problems of nuclear pumped lasers, Arzamas (Russian Federation), 26-30 Sep 1994). Order Number DE95000536. Source: OSTI; NTIS; GPO Dep.

Nuclear reactor-pumped lasers (RPLs) have been developed in the US by the Department of Energy for over two decades, with the primary research occurring at Sandia National Laboratories and Idaho National Engineering Laboratory. The US program has experimentally demonstrated reactor-pumped lasing in various mixtures of xenon, argon, neon, and helium at wavelengths of 585, 703, 725, 1,271, 1,733, 1,792, 2,032, 2,630, 2,650, and 3,370 nm with intrinsic efficiency as high as 2.5%. The major strengths of a reactor-pumped laser are continuous high-power operation, modular construction, self-contained power, compact size, and a variety of wavelengths (from visible to infrared). These characteristics suggest numerous applications not easily accessible to other laser types. The continuous high power of an RPL opens many potential manufacturing applications such as deep-penetration welding and cutting of thick structures, wide-area hardening of metal surfaces by heat treatment or cladding application, wide-area vapor deposition of ceramics onto metal surfaces, production of sub-micron sized particles for manufacturing of ceramics, and 3-D ceramic lithography. In addition, a ground-based RPL could beam its power to space for such activities as illuminating geosynchronous communication satellites in the earth's shadow to extend their lives, beaming power to orbital transfer vehicles, removing space debris, and providing power (from earth) to a lunar base during the long lunar night.

1509 (SAND–94-2542C) **Development status of an intense beam klystron.** Coleman, P.D. (Sandia National Labs., Albuquerque, NM (United States)); Lemke, R.W.; Hendricks, K.J.; Arman, M.J.; Bowers, L.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410218–1: Pulsed radio frequency sources for linear colliders, Long Island, NY (United States), 2-7 Oct 1994). Order Number DE95000745. Source: OSTI; NTIS; GPO Dep.

Investigations are being performed on a high current (16 kA), mildly relativistic (400kV), L-band klystron source. Experiments are in an early stage, and thus far have progressed to beam modulation studies. This paper discusses general klystron design considerations, beam propagation results, initial modulation results, and various extraction techniques being considered.

1510 (UCRL-JC–116774) **Observation of strong emission from NeIX and NeX transitions in a laser-driven plasma.** Crane, J.K.; Ditmire, T.; Nguyen, H.; Perry, M.D. Lawrence Livermore National Lab., CA (United States). Jul 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940592–8: 4. international colloquium on X-ray

lasers, Williamsburg, VA (United States), 16-20 May 1994). Order Number DE95002265. Source: OSTI; NTIS; GPO Dep.

The authors observe strong emission from the $1s^2$-1snp Rydberg series in He-like neon and from the Lyman-α transition in H-like neon. These emissions are observed when 1.05 μm light from a 650 femtosecond laser is focused into the dense, localized output of a pulsed, supersonic nozzle. The maximum focal irradiance of the laser was measured at full power in a vacuum to be 2×10^{18} W/cm^2. Although emissions from lower charge states such as Ne^{6+} and Ne^{7+} closely follow rates predicted by tunneling theory, emissions from Ne^{8+} and Ne^{9+} are observed at irradiances two order of magnitude below tunneling theory estimates (e.g. the He-α line appears at 2×10^{17} W/cm^2). They discuss the origins of these anomalously high charge states and the implications to recombination-pumped x-rays lasers.

1511 (UCRL-JC–116930) **LLNL/Lion Precision LVDT amplifier.** Hopkins, D.J. Lawrence Livermore National Lab., CA (United States). Apr 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9404131–3: American Society for Precision Engineering (ASPE) conference, Tucson, AZ (United States), 6-8 Apr 1994). Order Number DE95001504. Source: OSTI; NTIS; GPO Dep.

A high-precision, low-noise, LVDT amplifier has been developed which is a significant advancement on the current state of the art in contact displacement measurement. This amplifier offers the dynamic range of a typical LVDT probe but with a resolution that rivals that of non contact displacement measuring systems such as capacitance gauges and laser interferometers. Resolution of 0.1 μ in with 100 Hz bandwidth is possible. This level of resolution is over an order of magnitude greater than what is now commercially available. A front panel switch can reduce the bandwidth to 2.5 Hz and attain a resolution of 0.025 μ in. This level of resolution meets or exceeds that of displacement measuring laser interferometry or capacitance gauge systems. Contact displacement measurement offers high part spatial resolution and therefore can measure not only part contour but surface finish. Capacitance gauges and displacement laser interferometry offer poor part spatial resolution and can not provide good surface finish measurements. Machine tool builders, meteorologists and quality inspection departments can immediately utilize the higher accuracy and capabilities that this amplifier offers. The precision manufacturing industry can improve as a result of improved capability to measure parts that help reduce costs and minimize material waste.

43 PARTICLE ACCELERATORS

1512 (JAERI-Conf–94-003) **Proceedings of the 19th linear accelerator meeting in Japan.** Japan Atomic Energy Research Inst., Tokyo (Japan). Jul 1994. 346p. (In Japanese, English). (CONF-9407138–: 19. linear accelerator meeting in Japan, Tokai (Japan), 20-22 Jul 1994). Order Number DE95709882. Source: OSTI; NTIS; INIS.

This publication is the collection of the papers presented at the title meeting. The 100 of the presented papers are indexed individually. (J.P.N.).

4301 Design, Development, and Operation

Refer also to citation(s) 1237, 1693, 1871, 1890, 1913

1513 (AREAEE–312) **Safety in design and operation of low energy particle accelerators.** Badawy, I. Nuclear Research Centre, Inshas (Egypt). 1991. 18p. Order Number DE95606415. Source: OSTI; NTIS (US Sales Only); INIS.

This paper studies the safety in design and operation of low energy accelerators which produce beams of accelerated charged particles and radiations. As radiation sources, the accelerators are widely used in scientific research, industry, food and medical applications. The risks to human and environment are considered. The safety in accelerators is discussed-particularly-the shielding against ionizing radiations, overexposure to RF radiation fire hazards and power failures. Also the paper studies the emergency response at incidents. Emergency procedures are recommended for each type of emergency. Reporting to the competent Authority is also recommended to be prepared for each incident. The basic principles of regulatory control, licensing and inspections for accelerator facilities are discussed. The relation with the competent authority is pointed out. 4 fig.

1514 (BNL–60093) **Update on the ATF inverse Cerenkov laser acceleration experiment.** Kimura, W.D. (STI Optronics, Inc., Bellevue, WA (United States)); Steinhauer, L.C.; Kim, G.H.; Tidwell, S.C.; Pogorelsky, I.; Kusche, K.P. Brookhaven National Lab., Upton, NY (United States). [1993]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; AC06-83ER40128. (CONF-930511–522: PAC '93: international particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE95002224. Source: OSTI; NTIS; INIS; GPO Dep.

The inverse Cerenkov acceleration (ICA) experiment is being performed on the Accelerator Test Facility (ATF) located at Brookhaven National Laboratory. This facility presently features a 50 MeV e-beam and a ~10 GW peak power CO_2 laser. In the experiment 1.7 atm of H_2 gas is used to slow the phase velocity of the light wave to match the electron velocity. The Cerenkov angle is 20 mrad and the interaction length is 20 cm. A peak energy gain of ~12 MeV is predicted assuming 5-GW of laser peak power delivered to the interaction region. An update of the experiment's progress is presented.

1515 (BNL–60774) **Waveguiding by axicon-focused laser beams.** Pogorelsky, I.V. (Brookhaven National Lab., Upton, NY (United States)); Kimura, W.D.; Liu, Y. Brookhaven National Lab., Upton, NY (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940681–2: Advanced accelerator concepts workshop, Lake Geneva, WI (United States), 13-18 Jun 1994). Order Number DE95002174. Source: OSTI; NTIS; INIS; GPO Dep.

We propose a method for formation of a long plasma waveguide based on axicon focusing of a radially polarized CO_2 laser pulse into a uniform, low density discharge plasma. simulations demonstrate that an extended cylindrical plasma channel with a wall height $\Delta N_e = 1.5 \times 10^{16} cm^{-3}$ will be produced in a DC or RF discharge in 0.17 atm of hydrogen after axicon-focusing of a nanosecond 1-GW/cm^2 CO_2 laser pulse.

1516 (BNL–60826) **Approach to compact terawatt CO_2 laser system for particle acceleration.** Pogorelsky, I.V. (Brookhaven National Lab., Upton, NY (United States)); Kimura, W.D.; Fisher, C.H.; Kannari, F.; Kurnit, N.A. Brookhaven National Lab., Upton, NY (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940681–1: Advanced accelerator concepts workshop, Lake Geneva, WI (United States), 13-18 Jun 1994). Order Number DE95002170. Source: OSTI; NTIS; INIS; GPO Dep.

A compact table-top 20-GW 50-ps CO_2 laser system is in operation for strong-field physics studies at the ATF. We propose scaling up of the picosecond CO_2 laser to a terawatt peak power level to meet the requirements of advanced laser accelerators. Computer modeling shows that a relatively compact single-beam picosecond CO_2 laser system with a high-pressure x-ray picosecond amplifier of a 10-cm aperture is potentially scalable to the ~1-TW peak power level.

1517 (BNL–60827) **Milestone experiments for single pass UV/X-ray FELs.** Ben-Zvi, I. Brookhaven National Lab., Upton, NY (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9408146–9: 16. international free electron laser conference, Stanford, CA (United States), 21-26 Aug 1994). Order Number DE95002176. Source: OSTI; NTIS; INIS; GPO Dep.

In the past decade, significant advances have been made in the theory and technology of high brightness electron beams and single pass FELS. These developments facilitate the construction of practical UV and X-ray FELs and has prompted proposals to the DOE for the construction of such facilities. There are several important experiments to be performed before committing to the construction of dedicated user facilities. Two experiments are under construction

in the IR, the UCLA Self Amplified Spontaneous Emission experiment and the BNL laser seeded Harmonic Generation experiment. A multi-institution collaboration is being organized about a 210 MeV electron linac available at BNL and the 10 meter tong NISUS wiggler. This experiment will be done in the UV and will test various experimental aspects of electron beam dynamics, FEL exponential regime with gain guiding, start up from noise, seeding and harmonic generation. These experiments will advance the state of FEL research and lead towards future dedicated users' facilities.

1518 (CEA-LNS-GT-ME–92-01) **Dimensions resulting from $\delta\Phi_s.\delta(\Delta E)_L$ defects.** Leleux, G.; Tkatchenko, A. Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dec 1991. 2p. (In French). Order Number DE95606416. Source: OSTI; NTIS (US Sales Only); INIS.

We show that the test of phase and field level fluctuations of the recirculation LINAC cavities depend of the longitudinal wave number. (authors).

1519 (CEA-LNS-GT-ME–92-02) **Final energy dependence on phase fluctuations $\delta\Phi_s$ and on the level of $(\Delta E)_L$.** Leleux, G.; Tkatchenko, A. Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dec 1991. 4p. (In French). Order Number DE95606417. Source: OSTI; NTIS (US Sales Only); INIS.

Calculus of the energy variations at the output of a recirculation LINAC ought to phase and field level fluctuations of the accelerator cavities are presented. (authors). 1 ref.

1520 (IPNO-DRE–93-16) **On the capabilities of present radioactive beam facilities.** Mueller, A.C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 17p. (CONF-930534–: 3. international conference on radioactive nuclear beams, East Lansing, MI (United States), 24-27 May 1993). Order Number DE95606419. Source: OSTI; NTIS (US Sales Only); INIS.

The possibilities and limitations of present, i.e. existing, radioactive beam facilities are reviewed. After a definition of the criteria used for an evaluation, the discussion is mainly oriented on the complementarity between the ISOL-method and fast recoil separators. (author) 76 refs., 7 figs., 2 tabs.

1521 (LA–12835-C) **Proceedings of the Workshop on Simulating Accelerator Radiation Environments.** Palounek, A.P.T. (comp.). Los Alamos National Lab., NM (United States). Oct 1994. 269p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-930168–: Simulating accelerator radiation environments workshop, Santa Fe, NM (United States), 11-15 Jan 1993). Order Number DE95001755. Source: OSTI; NTIS; INIS; GPO Dep.

Interest in simulation techniques for high energy particle, nuclear, and medical physics continues to grow. These fields have many similar calculational needs, but seldom communicate recent developments to one another. The Workshop on Simulating Accelerator and Radiation Environments (SARE) was held in Santa Fe during January 11–15, 1993. The primary aim of the workshop was to provide a survey of the status and future needs and developments of simulations of the radiation environments at accelerator facilities used in high energy particle and nuclear physics. The workshop focused on the calculational needs of various proposed facilities and experiments, descriptions of currently available codes, code comparisons and benchmarking efforts, and overviews of present experience. The presentations included in these proceedings show that the needs of current and proposed facilities are many, but that several calculational techniques and methods are available. The individual papers have been indexed separately elsewhere.

1522 (LA-UR–94-3462) **Preformed transient gas channels for laser wakefield particle acceleration.** Wood, W.M. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941062–2: Annual meeting of the Optical Society of America, Dallas, TX (United States), 2-7 Oct 1994). Order Number DE95002707. Source: OSTI; NTIS; GPO Dep.

Acceleration of electrons by laser-driven plasma wake fields is limited by the range over which a laser pulse can maintain its intensity. This distance is typically given by the Rayleigh range for the focused laser beam, usually on the order of 0.1 mm to 1 mm. For practical particle acceleration, interaction distances on the order of centimeters are required. Therefore, some means of guiding high intensity laser pulses is necessary. Light intensities on the order of a few times 10^{17} W/cm^2 are required for laser wakefield acceleration schemes using near IR radiation. Gas densities on the order of or greater than 10^{17} cm^{-3} are also needed. Laser-atom interaction studies in this density and intensity regime are generally limited by the concomitant problems in beam propagation introduced by the creation of a plasma. In addition to the interaction distance limit imposed by the Rayleigh range, defocusing of the high intensity laser pulse further limits the peak intensity which can be achieved. To solve the problem of beam propagation limitations in laser-plasma wakefield experiments, two potential methods for creating transient propagation channels in gaseous targets are investigated. The first involves creation of a charge-neutral channel in a gas by an initial laser pulse, which then is ionized by a second, ultrashort, high-intensity pulse to create a waveguide. The second method involves the ionization of a gas column by an ultrashort pulse; a transient waveguide is formed by the subsequent expansion of the heated plasma into the neutral gas.

1523 (LBL–35966) **The principle of phase stability and the accelerator program at Berkeley, 1945–1954.** Lofgren, E.J. Lawrence Berkeley Lab., CA (United States). Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (HIFAN–667; CONF-9407133–2: 50th anniversary of the phase stability principle meeting, Moscow (Russian Federation), 12-15 Jul 1994). Order Number DE95002339. Source: OSTI; NTIS; INIS; GPO Dep.

The discovery of the Principle of Phase Stability by Vladimir Veksler and Edwin McMillian and the end of the war released a surge of accelerator activity at the Lawrence Berkeley Laboratory (then The University of California Radiation Laboratory). Six accelerators incorporating the Principle of Phase Stability were built in the period 1945–1954.

1524 (LBL–36110) **Wavelength and power stability measurements of the Stanford SCA/FEL.** van der Geer, B.; de Loos, M.J.; Conde, M.E.; Leemans, W.P. Lawrence Berkeley Lab., CA (United States). Aug 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CBP–103; CONF-9408146–11: 16. international free electron laser conference, Stanford, CA (United States), 21-26 Aug 1994). Order Number DE95002334. Source: OSTI; NTIS; INIS; GPO Dep.

Wavelength and power stability of the Stanford infrared SCA/FEL operating with the TRW wiggler have been measured using a high-resolution spectrometer and an image dissector system. The image dissector is capable of reading the spectrum of every single micropulse at 12 MHz throughout a macropulse of up to 2 ms duration. The intrinsic wavelength and power stability of the SCA/FEL are found to be $\delta\lambda/\lambda$=0.035% and δP/P=18%. The use of a feedback control system to stabilize the wavelength, and an acousto-optic modulator for output power smoothing, improves the performance to $\delta\lambda/\lambda$=0.012% and δP/P=7%.

1525 (SAND–94-1859C) **New developments in high average power short-pulse induction accelerators for industrial and environmental applications.** Neau, E.L.; Prestwich, K.R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941129–2: Conference on application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95001612. Source: OSTI; NTIS; INIS; GPO Dep.

Short-Pulse accelerator technology developed during the early 1960's through the late 1980's is being extended to high average power systems capable of use in industrial and environmental applications. Kilowatts to megawatts of beam power will be required for processes requiring high dose levels and/or high volume throughput require systems. Accelerating potentials can range from less than 1 MeV to as much as 10 MeV depending on the type of beam, depth of penetration required, and the density of the product being treated. This paper addresses the status of a new family of high average power systems, with output beam power levels up to 300 kW, that use saturable core switches to achieve output pulse

widths of 50 to 80 nanoseconds. Inductive adders and field emission cathodes are used to generate beams of electrons or x-rays at up to 2.5 MeV over areas of 1000 cm^2. Similar high average power technology is being used at $\leq$ 1 MeV to drive repetitive ion beam sources for treatment of material surfaces over 100's of cm^2.

1526 (SLAC-PUB–6449) **Prospects for high power Linac Coherent Light Source (LCLS) development in the 1000Å – 1Å wavelength range.** Tatchyn, R. (and others); Bane, K.; Boyce, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Mar 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0068; CONF-940592–9: 4. international colloquium on X-ray lasers, Williamsburg, VA (United States), 16-20 May 1994). Order Number DE95002777. Source: OSTI; NTIS; INIS; GPO Dep.

Electron bunch requirements for single-pass saturation of a Free-Electron Laser (FEL) operating at full transverse coherence in the Self-Amplified Spontaneous Emission (SASE) mode include: (1) a high peak current, (2) a sufficiently low relative energy spread, and (3) a transverse emittance ε[r-m] satisfying the condition $\varepsilon \leq \lambda A/4\pi$, where λ[m] is the output wavelength of the FEL. In the insertion device that induces the coherent amplification, the prepared electron bunch must be kept on a trajectory sufficiently collinear with the amplified photons without significant dilution of its transverse density. In this paper we discuss a Linac Coherent Light Source (LCLS) based on a high energy accelerator such as, e.g., the 3km S-band structure at the Stanford Linear Accelerator Center (SLAC), followed by a long high-precision undulator with superimposed quadrupole (FODO) focusing, to fulfill the given requirements for SASE operation in the 1000Å–1Å range. The electron source for the linac, an RF gun with a laser-excited photocathode featuring a normalized emittance in the 1–3 mm-mrad range, a longitudinal bunch duration of the order of 3 ps, and approximately 10^{-9} C/bunch, is a primary determinant of the required low transverse and longitudinal emittances. Acceleration of the injected bunch to energies in the 5–25 GeV range is used to reduce the relative longitudinal energy spread in the bunch, as well as to reduce the transverse emittance to values consistent with the cited wavelength regime. Two longitudinal compression stages are employed to increase the peak bunch current to the 2–5 kA levels required for sufficiently rapid saturation. The output radiation is delivered, via a grazing-incidence mirror bank, to optical instrumentation and a multi-user beam line system. Technological requirements for LCLS operation at 40Å, 4.5Å, and 1.5Å are examined.

4302 Beam Dynamics, Field Calculations, and Ion Optics

Refer also to citation(s) 1592, 1608, 1609

1527 (BNL–52439) **Crystalline beams.** Wei, Jie (Brookhaven National Lab., Upton, NY (United States)); Li, Xiao-Ping; Sessler, A.M. Brookhaven National Lab., Upton, NY (United States). 6 Oct 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95002656. Source: OSTI; NTIS; INIS; GPO Dep.

The low energy states of a beam of charged particles subject to circumferentially varying guiding and focusing forces are studied by first deriving a Hamiltonian in the rest frame of the circulating reference particle. and then using the molecular dynamics method. In an alternating gradient structure, operating below the transition energy, (but not in a constant gradient ring), the lowest state is ordered. The nature of the ground state depends upon the beam, density and the ring parameters. At very low temperature the crystal remains intact for a long time, but as temperature increases it rapidly gains energy from the lattice. In order for the crystalline beam to last a meaningful length of time, the storage ring should be designed such that the lattice periodicity of the machine is at least twice as high as the betatron frequencies.

1528 (BNL–60862) **Effects of RF side-bands on spectral reproducibility for infrared synchrotron radiation.** Biscardi, R. (Brookhaven National Lab., Upton, NY (United States)); Ramirez, G.; Williams, G.P.; Zimba, C. Brookhaven National Lab., Upton, NY (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940714–37: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95002450. Source: OSTI; NTIS; INIS; GPO Dep.

We have investigated the effects of audio side-bands from the main RF of the NSLS VUV storage ring on beam motion and specifically on spectral reproducibility in the infra-red region. For this spectral region it is advantageous to use Michelson interferometers because of their high throughput (Jacquinot advantage). A second advantage is that interferometers inherently give a multiplex or Felgett advantage, since one is always looking at all the wavelengths for all of the measuring time, even though there is only one detector. In such instruments it is beneficial to scan the moving mirror at a fast rate so that any mechanical or other low frequency noise shows up as a slow modulation in the interferogram and disappears altogether in the Fourier transform from the spectral region of interest. However, audio frequency side-bands appear from the RF energy restoring cavity as noise on the beam. These always occur at multiples of 60 Hz and can thus be readily identified. They can also be confirmed by changing the mirror velocity which changes where they appear in the spectra in a predictable way. In the present work, we measured spectra while simultaneously reducing and shifting the side bands in the RF and thus were able to correlate the effects and ultimately eliminate them as a source of noise. Ultimately we were able to achieve reproducibilities of <1% in 15 seconds of scanning time across the entire spectral region from 800 cm^{-1} to 4000cm^{-1} with a sample throughput of only 10^{-10} $meter^2$ steradians.

1529 (BNL–60876) **Crystalline beams: The horizontal zigzag: Informal report.** Haffmans, A.F.; Maletic, D.; Ruggiero, A.G. Brookhaven National Lab., Upton, NY (United States). 8 May 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95002227. Source: OSTI; NTIS; INIS; GPO Dep.

The authors continue their investigation of "Crystalline Beams" in the ground state. In this paper they study the possibility of storing an intense beam of charged particles in a storage ring where the particles acquire a horizontal zigzag configuration. They define the equilibrium configuration, and examine the confinement and stability conditions. The problem of "shear" between particles circulating side by side caused by the curvature of the trajectories is examined and solved.

1530 (BNL–60878) **Confinement and stability of crystalline beams in storage rings.** Haffmans, A.F. Brookhaven National Lab., Upton, NY (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940681–3: Advanced accelerator concepts workshop, Lake Geneva, WI (United States), 13-18 Jun 1994). Order Number DE95002515. Source: OSTI; NTIS; INIS; GPO Dep.

We present a fully analytical approach to the study of tile confinement and stability of "Crystalline Beams" in storage rings, in terms of such fundamental accelerator concepts as tune shift and stopband. We consider a "Crystalline Beam" consisting of substrings, arranged symmetrically around the reference trajectory, and we examine the motion of a slightly perturbed test particle on one of them. Our approach quite naturally leads to the conclusion, that (a) storage rings need to be operated below the transition energy, and (b) the "Crystalline Beam" has the same periodicity as the storage ring. Each "Crystalline Beam" has an upper and lower limit of the spacing between the ions. The upper limit is determined by condition (b), and the lower limit is set by the stability of the test particle motion around the equilibrium.

1531 (CERN–94-02) **A normal form approach to the theory of nonlinear betatronic motion.** Bazzani, A. (European Organization for Nuclear Research, Geneva (Switzerland)); Todesco, E.; Turchetti, G. European Organization for Nuclear Research, Geneva (Switzerland). 24 Mar 1994. 225p. Order Number DE95603831. Source: OSTI; NTIS (US Sales Only); INIS.

The betatronic motion of a particle in a circular accelerator is analysed using the transfer map description of the magnetic lattice. In the linear case the transfer matrix approach is shown to be equivalent to the Courant-Snyder theory: In the normal coordinates'

representation the transfer matrix is a pure rotation. When the nonlinear effects due to the multipolar components of the magnetic field are taken into account, a similar procedure is used: a nonlinear change of coordinates provides a normal form representation of the map, which exhibits explicit symmetry properties depending on the absence or presence of resonance relations among the linear tunes. The use of normal forms is illustrated in the simplest but significant model of a cell with a sextupolar nonlinearity which is described by the quadratic Henon map. After recalling the basic theoretical results in Hamiltonian dynamics, we show how the normal forms describe the different topological structures of phase space such as KAM tori, chains of islands and chaotic regions; a critical comparison with the usual perturbation theory for Hamilton equations is given. The normal form theory is applied to compute the tune shift and deformation of the orbits for the lattices of the SPS and LHC accelerators, and scaling laws are obtained. Finally, the correction procedure of the multipolar errors of the LHC, based on the analytic minimization of the tune shift computed via the normal forms, is described and the results for a model of the LHC are presented. This application, relevant for the lattice design, focuses on the advantages of normal forms with respect to tracking when parametric dependences have to be explored. (orig.).

1532 (FNAL/C–94/253) **Emittance growth due to negative-mass instability above transition.** Ng, King-Yuen. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9407121–4: Workshop on beam instabilities in storage rings, Hefei (China), 25-30 Jul 1994). Order Number DE95002527. Source: OSTI; NTIS; INIS; GPO Dep.

Due to space-charge effect, there is a growth of bunch emittance across transition as a result of negative-mass instability. The models of growth at cutoff frequency and growth from high-frequency Schottky noise are reviewed. The difficulties of performing reliable simulations are discussed. An intuitive self-bunching model for estimating emittance growth is presented.

1533 (FNAL-TM–94/1903) **Derivation of coupling impedance from the wake potential of a finite bunch.** Ng, King-Yuen. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95002529. Source: OSTI; NTIS; INIS; GPO Dep.

The coupling impedance of the vacuum chamber can be obtained from the wake potential left by a bunch of finite extent. Oftentimes, however, the impedance so obtained violates the condition that its real part must be everywhere non-negative. The proper treatment is derived and discussed.

1534 (FNAL-TM–1878) **Optimizing the length of the stores and related effects.** McCrory, E. Fermi National Accelerator Lab., Batavia, IL (United States). 7 Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95002531. Source: OSTI; NTIS; INIS; GPO Dep.

This memo is an attempt to create an accurate analytical model for the luminosity obtained in the Fermilab Tevatron during collider operation. Other people, in particular Alan Hahn and, aledgedly, Vinod Bharadwaj and Gerry Dugan, have addressed this topic and predicted an optimum store duration. The approach taken here is slightly different from Hahn's, in particular, analytic forms for the model are written down and the optima are found directly, through differentiation. Also, specifying the parameters clearly is helpful in understanding the dependencies of this phenomenoiogy. First, the optimum store duration is derived from first principles. Then graphs of this are made and various assumptions on the parameters are analyzed. Then some related effects are discussed. The figures are segregated at the end of this Memo.

1535 (FNAL-TM–1896) **Xwake 1.0 user's manual.** Saewert, G.; Jurgens, T.; Harfoush, F. Fermi National Accelerator Lab., Batavia, IL (United States). Jul 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95002528. Source: OSTI; NTIS; GPO Dep.

Xwake is a user friendly Finite Difference Time Domain (FDTD) code for wake potential and impedance calculations of rotationally symmetric structures. Geometry boundaries are automatically meshed, or modeled, by a choice of either of two approximations, the typical "stepped edge" modeling, or the new "contour" modeling. Contouring means geometry boundaries described with curves and angles are not distorted to follow the rectangular grid; rather, the grid is adjusted to follow the contour of the geometry boundaries. It offers computer run time savings for large problems or intricate geometries for a given mesh compared with stepped edge modeling. Using stepped approximations with Xwake, on the other hand, one is able to model materials of any linear media type. Ultimately, three solutions are computed, wake potential versus wake length, wake spectrum versus frequency - a Fourier transform (FFT) of the wake potential, and wake impedance versus frequency. Xwake is an OSF/Motif application providing a graphical user interface (GUI) for ease of use. It is written in ANSI C for portability and currently runs on UNIX platforms.

1536 (KEK-PROC–93-10, pp. 148-152) **Behavior of off-centered beams in an RFQ due to image charge force.** Wu Guanglu (Tokyo Inst. of Tech. (Japan). Research Lab. for Nuclear Reactors); Oguri, Yoshiyuki; Hattori, Toshiyuki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Behavior of misaligned beams in an RFQ was analyzed by using a 3-D PIC (Particle-In-Cell) computer code QLASSI2. Trajectories of 2^8 macro particles were simultaneously traced using a supercomputer. The potential for the image charge force from the metallic walls was expanded into a Fourier-Bessel series including odd-number order harmonics. Results obtained with and without image charge effects have been compared with each other. Both calculations predict fairly similar behavior. There is, however, an observable difference not only on transmission, but also on trajectory and output emittance of the beam. It has been found that the amplitudes of coherent transverse beam oscillation in the RFQ are enhanced owing to the effects of image charge forces. (author).

1537 (KEK-PROC–93-10, pp. 153-156) **Particle optics in the TIT-RFQ calculated using a 3D particle-in-cell code.** Oguri, Yoshiyuki (Tokyo Inst. of Tech. (Japan). Research Lab. for Nuclear Reactors); Okamura, Masahiro. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Beam dynamics in an RFQ at the Tokyo Institute of Technology was analyzed using a 3D particle-in-cell computer code. In this calculation not only space charge force between each macroparticles but also 3D image charge field were included. Beam transmission performance was calculated for two types of vane-tip design with different tip curvature radii. These results are compared with ones obtained with the idealized linear two-term potential. The old vane tip design with a small tip curvature radius has given very poor beam transmission efficiency which cannot be accepted for the actual machine. (author).

1538 (KEK-PROC–93-10, pp. 176-178) **Cold model test of a DTL with transition from 4π to 2π-mode acceleration.** Ikeda, Kazumi (Mitsubishi Atomic Power Industries, Inc., Tokyo (Japan)); Kan, Taro; Yoshizawa, Kunio. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A cold model test has been carried out using a constant-velocity model for the investigation of a DTL with transition 4π to 2π-mode acceleration. The measurements with the Bead perturbation Method reveal that a field difference of about 5% exists between the average fields in the 4π and 2π-mode cell. Field stabilization by post coupler is improved by using slightly different spacings between the drift tube and the post coupler for the 4π and 2π-mode cells. The extra stem on each drift tube improves the fields stability

when the stems are installed in line each other. The stability, however, is not improved when the stems are installed cross-wise each other. (author).

1539 (LA-UR–94-3351) **Moment approach to high-order accelerator beam optics.** Lysenko, W.P. Los Alamos National Lab., NM (United States). [1994]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410229–1: 4. international conference on charged particle optics, Tsukuba (Japan), 3-6 Oct 1994). Order Number DE95001018. Source: OSTI; NTIS; INIS; GPO Dep.

High-current beams must be matched to high order to minimize emittance growth and particle losses. For matching problems, the moment approach, in which the author describes the particle beam by the moments of its distributions, is particularly valuable. A variety of analytical results are available for linear motion. The moment approach is also the basis of the 3-D space-charge simulation code BEDLAM, in which the dynamical variables are the moments. Moment simulation codes are particularly useful for computing beams matched to nonlinear systems. This paper outlines what is known about the moment approach, describes work in progress on new space-charge models, and describes further potential applications of and improvements to moment-method simulations.

1540 (SSCL–678) **The 12-GeV/c beam transfer and absorber lines for the Superconducting Super Collider.** Mao, N. (Superconducting Super Collider Lab., Waxahachie, TX (United States)); McGill, J.; Gerig, R.; Brown, K. Superconducting Super Collider Lab., Waxahachie, TX (United States). Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95002100. Source: OSTI; NTIS; INIS; GPO Dep.

The beam optics of the 12-GeV/c proton beam transfer line between the Low Energy Booster (LEB) and the Medium Energy Booster (MEB) at the Superconducting Super Collider is presented. The beam is extracted from the LEB vertically and is injected into the MEB through a vertical Lambertson magnet and a horizontal kicker. The beamline has high flexibility for amplitude and dispersion function matching. Effects of various errors in the transfer line are studied, and a beam position correction scheme is proposed. The beam optics of the 12-GeV/c absorber line transporting the beam from the LEB to an absorber during the LEB commissioning is also presented.

4303 Auxiliaries and Components

Refer also to citation(s) 1540, 1604, 1605, 1610, 1611, 1612, 1613, 1614, 1622, 1624, 1626, 1628, 1694, 2338

1541 (BNL–47476) **Specification of the surface figure and finish of optical elements in terms of system performance.** Church, E.L. (ARDEC, Picatinny, NJ (United States)); Takacs, P.Z. Brookhaven National Lab., Upton, NY (United States). Sep 1992. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9209295–3: Society of Photo Optical Instrumentation Engineers (SPIE/EOS) international symposium on optical design systems, Berlin (Germany), 14-19 Sep 1992). Order Number DE95002222. Source: OSTI; NTIS; INIS; GPO Dep.

Brookhaven National Laboratory is the site of the National Synchrotron Light Source (NSLS); an electron synchrotron which is an intense source of hard and soft x-rays. Since there are no effective refracting elements for x rays, this radiation must be manipulated and focused by mirrors configured to give high reflectivity. This paper describes methods of predicting the degradation of the performance of a simple imaging system in terms of the statistics of the shape errors of the focusing element, and conversely, of specifying those statistics in terms of requirements on image quality. Results are illustrated for a normal-incidence x-ray mirrors having figure errors plus conventional and/or fractal finish errors.

1542 (BNL–52424-Rev.9/94) **Gas cooled leads: This report consists of three independent parts, Part 1 covers the theory, Parts 2 and 3 present specific lead designs: Revision.** Shutt, R.P.; Rehak, M.L.; Hornik, K.E. Brookhaven National Lab., Upton, NY (United States). 7 Dec 1993. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95002657. Source: OSTI; NTIS; INIS; GPO Dep.

The intent of this paper is to cover as completely as possible and in sufficient detail the topics relevant to lead design. The first part identifies the problems associated with lead design, states the mathematical formulation, and shows the results of numerical and analytical solutions. The second part presents the results of a parametric study whose object is to determine the best choice for cooling method, material, and geometry. These findings are applied in a third part to the design of high-current leads whose end temperatures are determined from the surrounding equipment. It is found that cooling method or improved heat transfer are not critical once good heat exchange is established. The range $5 < RRR < 100$ is found to be acceptable for the relative resistivity ratio of the material. Use of high transition temperature super conductor materials is not warranted for this application. The optimal geometry (L:Length, A:cross-section) for a given current (I) follows the relation $L I/A = 2 \times 105$ but extends over a large range of values. Mass flow needed to prevent thermal runaway varies linearly with current above a given threshold. Below that value, the mass flow is constant with current. Transient analysis shows no evidence of hysteresis. If cooling is interrupted, the mass flow needed to restore the lead to its initially cooled state grows exponentially with the time that the lead was left without cooling.

1543 (BNL–60553) **Instrumentation for on-line mountain range displays.** van Asselt, W.K.; Ahrens, L.A. Brookhaven National Lab., Upton, NY (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9410219–4: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95002226. Source: OSTI; NTIS; INIS; GPO Dep.

A method to obtain and process 'mountain range' displays of beam signals is described. A custom-made trigger generator and a digital oscilloscope are used for the data acquisition and the graphical interface package LabVIEW is used to process the data. High resolution displays of wall monitor signals updating every AGS cycle have proven very powerful as a beam diagnostic.

1544 (BNL–60874) **Technology transfer for industrial production of superconducting magnets for the RHIC project at BNL.** Wanderer, P.; Anerella, M.D.; Greene, A.F.; Kelly, E.; Willen, E. Brookhaven National Lab., Upton, NY (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941129–4: Conference on application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95002410. Source: OSTI; NTIS; INIS; GPO Dep.

Industrial production of superconducting magnets for the Relativistic Heavy Ion Collider (RHIC) has begun. The R&D for the magnets was carried out at BNL. Following the award of built-to-print contracts, staff from the laboratory and the vendors worked toward transferring both design principles and practical details to an industrial framework for cost effective production. All magnets made thus far have been acceptable for use in RHIC.

1545 (BNL–60907) **A safety system for personnel and equipment protection at the AGS and RHIC.** Zitvogel, E.P. Brookhaven National Lab., Upton, NY (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-941061–5: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 nov 1994). Order Number DE95002514. Source: OSTI; NTIS; INIS; GPO Dep.

Brookhaven's Booster and AGS accelerators will soon be operating in a mode whereby different particle species and intensities are alternately accelerated within the same machine during different machine cycles. This will allow the AGS to feed the experimental program and act as a RHIC injector when needed. Along with this great flexibility comes the burden of ensuring the safety of AGS and RHIC personnel and equipment by preventing the inadvertent acceleration of high intensity beam during a period intended for low intensity beam. The Co-injection monitoring system, under development now at BNL, will meet this need. This safety system will sense the intensity of the beam by integrating the beam current signal from a transformer and trip off the accelerator if the intensity

exceeds a preset level. The system is dual redundant and contains self-test circuitry to ensure its functionality. This paper describes the Co-injection system. Where available, results of the initial operation will be presented.

1546 (BNL–60926) **Wavelet analysis and accelerator signals.** Stillman, A. Brookhaven National Lab., Upton, NY (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9410219–5: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95002518. Source: OSTI; NTIS; INIS; GPO Dep.

Wavelets have suddenly become very popular in signal analysis applications. They have become a darling topic in several fields: astronomy, image processing, filtering, theoretical physics, and harmonic analysis, to name only a few. This paper focuses on applications for wavelet analsysis in accelerator engineering, specifically, signal processing. It is split into three parts; the first contrasts wavelet analysis with Fourier analysis, the second constructs a simple wavelet basis as a tutorial, the third demonstrates the analytic uses of wavelets with the help of a software analyzing tool.

1547 (CERN–94-03) **Workshop on beam cooling and related topics: Proceedings.** Bosser, J. (ed.). European Organization for Nuclear Research, Geneva (Switzerland). 26 Apr 1994. 468p. (CONF-9310380–: Workshop on beam cooling and related topics, Montreux (Switzerland), 4-8 Oct 1993). Order Number DE95606427. Source: OSTI; NTIS (US Sales Only); INIS.

The sessions of the Workshop on Beam Cooling and Related Topics, held in Montreux from 4-8 October 1993, are reported in these Proceedings. This meeting brought together international experts in the field of accelerator beam cooling. Its purpose was to discuss the status of the different cooling techniques currently in use (stochastic, electron, ionization, heavy-ion, and laser) and their actual performances, technological implications, and future prospects. Certain theoretical principles (muon cooling, cyclotron maser cooling) were discussed and are reported on in these Proceedings. Also of interest in this Workshop was the possibility of beam crystallization in accelerators using ultimate cooling. In the first part of these Proceedings, overview talks on the various cooling techniques, their implications, present performance, and future prospects are presented. More detailed reports on all the topics are then given in the form of oral presentations or poster sessions. Finally, the chairmen and/or convenors then present summary talks. (orig.).

1548 (FNAL/C–94/213) **Triggers for a high sensitivity charm experiment.** Christian, D.C. Fermi National Accelerator Lab., Batavia, IL (United States). Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9406242–3: Workshop on the future of high sensitivity charm experiments, Batavia, IL (United States), 7-9 Jun 1994). Order Number DE95002251. Source: OSTI; NTIS; INIS; GPO Dep.

Any future charm experiment clearly should implement an E_T trigger and a μ trigger. In order to reach the 10^8 reconstructed charm level for hadronic final states, a high quality vertex trigger will almost certainly also be necessary. The best hope for the development of an offline quality vertex trigger lies in further development of the ideas of data-driven processing pioneered by the Nevis/U. Mass. group.

1549 (FNAL-TM–1902) **Multi-batch P-bar production via snap coalescing: A plan to produce ~5× more antiprotons/cycle using mostly existing equipment.** Foster, G.W. Fermi National Accelerator Lab., Batavia, IL (United States). 3 Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95002212. Source: OSTI; NTIS; INIS; GPO Dep.

A method is described to increase the yield of Anti-Protons/cycle by about a factor of five, without building new storage rings. In this method, the full circumference of the Main Injector is filled and accelerated. Existing RF cavities are then used to perform "snap coalescing" which clumps the charge in azimuth to produce 28 large RF bunches ~5ns long. These are then extracted and targeted in a single 11μsec turn of the Main Injector. The resulting P-bars are injected into six turns of the Debuncher using a resonant kicker which injects every 21st RF bucket The result is that every 3rd RF bucket in the Debuncher is occupied. After an h=30 rotation in the Debuncher, ESME simulations indicate a final momentum spread of ±0.25%. This is comparable to the current momentum spread after debunching. It is superior to the momentum spreads of ±1.2% and ±2% which would be produced by the Compressor Ring and Linear Debuncher.

1550 (GSI–93-43) **Study of the many-dimensional transverse phase-space distributions of intense ion beams.** Riehl, G. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); Frankfurt Univ. (Germany). Fachbereich 13 - Physik. Dec 1993. 109p. (In German). Order Number DE95711708. Source: OSTI; NTIS (US Sales Only); INIS.

Aim of this thesis was the study of the transverse phase-space distributions of intense ion beams and especially the determination of the emittance growth and the filaments of the distributions. Developed was a facility, which determines under application of each two perpendicularly arranged slit apertures and profile grids and a multichannel current-amplifier plug-in both beam profile and beam emittance of the two transverse motion planes. After the determination of the 1- and 2-dimensional phase-space distributions was successfully realized, the facility was further developed for the measurement of the 3-dimensional phase-space distributions. The observed growth of the emittance and RMS growth on magnetic solenoids could be quantitatively determined and their different causes determined. The growth factors of an optically only slightly filamented beam emittance between 1.5 and 3.2 show that the beam quality is strongly interfered by such influences. The measurements showed beyond the causes and the connection between the filamentation of the emittance as well as the origin of the hollow beams and beam halos observed in many experiments. It could be shown that not only magnetic fields and space-charge fields but pricipally each radial-symmetric, nonlinear field couples the two transverse motion planes and by this causes in nearly all cases a growth of the beam emittance.

1551 (GSI–94-11) **Studies on the transport and on the focusing of intense, high-energetic heavy ion beams for the production of high energy density in matter.** Spiller, P.J. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Jul 1994. 97p. Order Number DE95711428. Source: OSTI; NTIS (US Sales Only); INIS.

A measurement place for the production of hot, dense plasmas by the bombardment of matter with intense, high-energetic ion beams, was constructed and taken into operation at GSI in Darmstadt. In order to reach the concentration of the beam energy required for the optimal heating of matter, a strong focusing system at the end of the beam transport system is required. A system consisting of five quadrupole and one dipole magnet was calculated at the II. Physical Institute of the JLU in Giessen and erected at the high-temperature (HT) measuring place. The ion-optical properties of this system were in the framework of this thesis studied and optimized. Especially connection between the operational mode of the heavy-ion synchrotron SIS, the beam transport to the HT measuring place, and the focusing properties were elaborated. by this it succeeded to produce the calculated circular focusing area with a radius of 145 μm. Regarding the high requirements on the transport of intense ion beams beside the so-called gradient method a new procedure for the determination of the entrance beam parameters and, based on this, an optimization of the adjustment of the beam guiding system was tested. Starting from the ion-current distribution in the focal plane it succeeded to calculate regarding the momentaneous magnet adjustment back to the phase-space volume at the entrance of the beam guiding system. Because the ion-current distribution in the focal plane of strongly focusing systems reacts very sensitively on changes of the mapping properties, hereby the exact optical and electrical properties of the focusing magnets had to be included in the form of measured fringe-field distributions and excitation curves. By the determination of the entrance phase-space parameter it succeeded to reach at optimal beam extraction fro the SIS a nearly hundred-percent transmission of the ion bundles to the high-temperature beam section.

1552 (INIS-BR–3446) **Exergetic analysis of refrigeration system of the Pelletron-Linac particle accelerator of the University of Sao Paulo.** Oliveira Filho, O.B. de (Sao Paulo Univ., SP (Brazil). Inst. de Fisica); Ordonez, J.F.; Oliveira Junior, S. de. Associacao Brasileira de Ciencias Mecanicas, Rio de Janeiro, RJ (Brazil). 1993. 4p. (In Portuguese). (CONF-931290–: 12. Brazilian congress on mechanical engineering, Brasilia (Brazil), 7-10 Dec 1993). Order Number DE95606424. Source: OSTI; NTIS (US Sales Only); INIS.

The Pelletron-Linac accelerator of the University of Sao Paulo will use the existing electrostatic Pelletron accelerator as an injector for the linear superconducting accelerator (Linac), to increase the acceleration of the particles. The Linac uses a forced flow circulation helium system to promote continuous refrigeration for long periods of time, at temperatures below or equal to 4,9 K. This paper shows the exergetic analysis of the Pelletron-linac refrigerator, identifying the main sources of irreversibilities and evaluating energetic consumption of the system. An exergy-enthalpy diagram for the helium shows the thermodynamic processes that take place in the refrigeration plant and the exergy losses. (author).

1553 (INIS-mf–14393, pp. 98) **Control and data acquisition system of electron linear accelerator for radiation processing.** Maciszewski, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Lukasiewicz, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992*. Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 fig. COMPUTERIZED CONTROL SYSTEMS/accelerator facilities; DATA ACQUISITION; ELECTRON BEAMS; IRRADIATION PLANTS

1554 (IPNO–93-02) **Thermal behaviour analysis of SRF cavities and superconducting HOM couplers: Numerical simulation and experimental results.** Fouaidy, M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Junquera, T.; Aune, B.; Chel, S.; Gratadour, J.; Juillard, M.; Mosnier, A.; Brizzi, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 10p. Order Number DE95606425. Source: OSTI; NTIS (US Sales Only); INIS.

Two individual papers appear in this report, titled Thermal model calculations in superconducting RF cavities, and Thermal study of HOM couplers for superconducting RF cavities. Both were indexed separately for the INIS database. (R.P.).

1555 (JINR-R–9-94-133) **Separated muon beams in the low-background laboratory of the JINR phasotron for studies involving the μSR-method.** Dem'yanov, A.V.; Drebushko, A.E.; Kononenko, G.A.; Mamedov, T.N.; Roganov, V.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 8p. (In Russian). Order Number DE95603842. Source: OSTI; NTIS (US Sales Only); INIS.

A description is presented of the muon beams created in the low background laboratory of the phasotron in direction III for studies of media with the aid of the μSR-method. The beam momentum is 125 MeV/c and the spread in momentum is lower than $\pm$ 5%. Three versions are obtained if the distribution in space of the beam on the target for experimental studies: (1) the beam is elongated horizontally; (2) the beam is elongated vertically; (3) the beam has a circular cross section. The intensity of the beam elongated horizontally amounts to $2.0 \cdot 10^5$ particles/s per 1 μA of extracted proton beam. Its half width in the horizontal plane is $\pm$ 4.4 cm, and in the vertical plane it is $\pm$ 1.8 cm. 3 refs.; 3 figs. (author).

1556 (KEK-PROC–93-10, pp. 137-140) **RF control of ICR proton linac.** Shirai, Toshiyuki (Kyoto Univ., Uji (Japan). Inst. for Chemical Research); Dewa, Hideki; Fujita, Hirokazu; Ikegami, Masanori; Iwashita, Yoshihisa; Kakigi, Shigeru; Okamoto, Hiromi; Noda, Akira; Inoue, Makoto. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

At the ICR Kyoto University, the proton linac has been developed. The RF high power is fed into the cavity from the klystron and the RF pulse width is 65 μsec. The RF amplitude and the phase in the cavity are affected by the beam loading and the pulse shape of the klystron cathode voltage. The fast RF stabilization system are required to accelerate the high beam stably. The stabilization system consists of the auto level control (ALC) and the phase locked loop (PLL). The designed band width is more than 1 MHz. The main modules of the circuit are the PIN diode attenuator, the fast phase detector, the phase shifter and the wideband feedback amplifier. The variation of the RF amplitude and the RF phase are 0.5 % with ALC and 5deg with PLL, respectively. (author).

1557 (KEK-PROC–93-10, pp. 141-144) **Tunable frequency 4-rod RFQ.** Iwashita, Yoshihisa (Kyoto Univ., Uji (Japan). Inst. for Chemical Research); Fujisawa, Hiroshi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The frequency tunability of the 4-rod RFQ is investigated. By moving the shorting plate between the posts, which support the 4-rod electrodes, the resonant frequency can be varied almost twofold. Model studies and the calculation of the field uniformity, the variation of Q, and the shunt impedance are reported. (author).

1558 (KEK-PROC–93-10, pp. 145-147) **Low power RF field tuning of a four-vane type RFQ for the JHP.** Ueno, Akira (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Yamazaki, Yoshishige. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A 432 MHz four-vane type radio-frequency quadrupole (RFQ) linac stabilized with π-mode stabilizing loops (PISLs) is under construction as a preinjector linac for the Japanese Hadron Project (JHP). It was designed to accelerate a 20-mA H^- beam from 50 keV to 3 MeV with a 3 % duty factor. In the RFQ, we obtained the uniform distribution within $\pm$1 % both longitudinally and azimuthally by adjusting the positions of dummy tuning plungers. The size of stab tuners and the standard positions of movable tuners were thus determined to reproduce the obtained field distribution. (author).

1559 (KEK-PROC–93-10, pp. 157-159) **Design and construction of the TIT RFQ.** Takeda, Osamu (Toshiba Corp., Kawasaki, Kanagawa (Japan)); Tanabe, Yoshio; Satoh, Kiyokazu; Kawatsu, Shosi; Okamura, Masahiro; Oguri, Yoshiyuki; Hattori, Toshiyuki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

At Tokyo Institute of Technology (TIT) a four-vane RFQ is to be applied for inertial confinement fusion research. The RFQ(TIT RFQ) is designed for acceleration of particles with charge to mass ratio (q/A) of 1/16 from 5 keV/amu to 213 keV/amu. The planned maximum injection current is 10 mA for $^{16}O^+$ and beam transmission is expected to be 60% as a result of a PIC code simulation. Structural and thermal analyses were carried out. (author).

1560 (KEK-PROC–93-10, pp. 160-164) **Study of a double gapped buncher for proton linac.** Dewa, Hideki (Kyoto Univ., Uji (Japan). Inst. for Chemical Research); Ikegami, Masanori; Inoue, Makoto; Iwashita, Yoshihisa; Okamoto, Hiromi; Kakigi, Shigeru; Shirai, Toshiyuki; Noda, Akira; Fujita, Hirokazu. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A double gapped buncher for a beam matching section between RFQ linac and Alvarez linac was studied. The buncher is a 433 MHz quarter wave length resonant cavity. Using approximated axially symmetric calculation, the optimization of the cavity was studied. The shunt impedance of the cavity was 2.2 MΩ per gap.

The designed voltage of 90 kV were generated in two gaps when the peak RF power of 3.6 kW was supplied. (author).

1561 (KEK-PROC–93-10, pp. 165-167) **Design of MEBT short Q-magnets with large bores using MAFIA for the JHP proton linac.** Yoshino, Kazuo (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Kato, Takao; Ueno, Akira; Yamazaki, Yoshishige. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A radio-frequency quadrupole (RFQ) linac and a drift-tube linac (DTL) are under development for the 1-GeV high-intensity proton linac of the JHP. The design of quadrupole magnets to be used in the medium-energy beam transport line (MEBT) from RFQ to DTL is described in this paper. Since the quadrupole magnets are short, being comparable to (1.4 to 2 times as long as) the bore diameter, the leakage flux along the beam axis is quite significant. Therefore, the multipole components of magnetic fields arising from the leakage flux should be minimized by choosing the pole-piece shape on the basis of the three-dimensional analysis. The integral of the field gradient along the beam axis could be flattened within 1×10^{-3} from the beam center to the bore radius. (author).

1562 (KEK-PROC–93-10, pp. 168-172) **Design of a beam transport line between the RFQ and the DTL for the 1-GeV proton linac.** Kato, Takao (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A beam transport line between the RFQ and the drift tube linac (DTL) for the 1-GeV proton linac was designed using four computer codes, MAGIC, BTSCF, BTFIT, and LEBT. The last three codes include the effects of the space-charge. The calculated results show no increase in the transverse emittance and about a 20%-increase in the longitudinal emittance for a 20-mA bunched proton beam. Properties of the beam line are studied in connection with the effects on the final beam qualities after a long acceleration with the 1-GeV proton linac. The effects of transverse mismatch at the DTL injection, arising from the difference in the calculation method between the code BTSCF and LEBT, are discussed. (author).

1563 (KEK-PROC–93-10, pp. 173-175) **R and D works of the DTL for the BTA in JAERI.** Hasegawa, K. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Sakogawa, K.; Kabeya, Z. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Development work of a Drift Tube Linac (DTL) for the Basic Technology Accelerator (BTA) is being continued. An electromagnetic quadrupole using a hollow conductor was chosen for the focusing magnet. Two quadrupole magnets were fabricated and examined. A 9-cell model tank is being fabricated and the high power test will be conducted. In this report, status of the R and D for the DTL is described. (author).

1564 (KEK-PROC–93-10, pp. 179-181) **Development of annular coupled structure.** Kageyama, T. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Morozumi, Y.; Yoshino, K.; Yamazaki, Y. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A $\pi/2$-mode standing-wave linac (f=1.296GHz) of an Annular Coupled Structure (ACS) has been developed for the 1-GeV proton linac of the Japanese Hadron Project (JHP). This ACS has four coupling slots between the accelerating and coupling cells in order to suppress higher order mode mixing with the $\pi/2$ coupling mode. High-β(β=v/c=0.78) and low-β(0.52) prototypes were constructed and tested up to each design RF power. Concerning the effect of the coupling slots on the fields of a coupled-cavity linac, it was found that the slot arrangement of the side-coupled structure (SCS) tilts the accelerating field from the beam axis. On the other hand, the four-slot arrangement of the ACS gives an almost axially symmetric accelerating field to the beam. (author).

1565 (KEK-PROC–93-10, pp. 182-184) **RF system of FELI linac.** Morii, Yasutsugu (Free Electron Laser Research Inst. Inc., Osaka (Japan)); Miyauchi, Yasuyuki; Keishi, Tomohiro; Koga, Akihiko; Abe, Seiya; Bessho, Isao; Nagai, Akio; Tomimasu, Takio. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

FELI (Free Electron Laser Research Institute, Inc.) is constracting a Free Electron Laser facility covering from 20μm (infrared region) to 0.35μm (ultra violet region), using an S-band linac. The building will be completed in November 1993 and linac will start to be installed in December 1993. RF system of linac for FEL is required of long pulse duration and high stability. An S-band klystron (Toshiba E3729) is operated in three pulse operation modes (pulse width and peak RF power); 24μs-24MW, 12.5μs-34MW, 0.5μs-70MW. Each klystron modulator has the PFN consisting of 4 parallel networks of 24 capacitors and 24 inductors, and it has a line switch of optical thyristor stack. (author).

1566 (KEK-PROC–93-10, pp. 185-187) **60MW S-band pulse klystron.** Sakamoto, Mitsunori (Toshiba Corp., Otawara, Tochigi (Japan)); Yonezawa, Hiroshi; Ohya, Keiji; Shirai, Nobuyuki; Okamoto, Tadashi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

60MW S-band pulse klystron has been under development for use of RF source of linear accelerators. A prototype klystron was built, and tested. RF output power of 62MW was achieved at beam voltage of 347kV with saturated efficiency of 47%. (author).

1567 (KEK-PROC–93-10, pp. 188-191) **Performance of the 46MW klystron for KEK B-factory.** Michizono, Shinichiro (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Nakao, Katumi; Honma, Hiroyuki; Saito, Yoshio; Fukuda, Shigeki; Anami, Shozo. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

An upgraded klystron was tested and an output power of 51.5MW was obtained at a beam voltage of 310kV and an rf pulse width of 4μs. The insulating ceramic, rf window ceramic and focusing magnetic field were improved for this klystron. In this paper, the klystron output power and temperature rise of the rf window due to the transmission of larger rf power were reported. (author).

1568 (KEK-PROC–93-10, pp. 192-194) **Multipactors in klystron cavities.** Hayashi, Kazutaka (Mitsubishi Electric Corp., Amagasaki, Hyogo (Japan). Communication Equipment Works); Iyeki, Hiroshi; Kikunaga, Toshiyuki. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A multipactor phenomenon in a klystron causes gain shortage or instability problem. Some tests using a prototype klystron input cavity revealed the microwave discharges in vacuum with magnetic field. The test results and the methods to avoid multipactors are discussed in this paper. (author).

1569 (KEK-PROC–93-10, pp. 195-198) **On limitations and improvements of klystron design code 'JPNDISK'.** Nishikawa,

Tomoyuki (Kumamoto Inst. of Tech. (Japan). Faculty of Engineering); Onodera, Toshio. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Klystron design code named JPNDISK, which have been made in the development of a 150MW S-band klystron, can predict performances of S-band klystrons and X-band medium output klystron quickly and exactly, but overstimates those of SL3 and SI4 which are under development in SLAC. In the paper, comparisons on existing klystrons between measurements and the calculations by JPNDISK are shown, and effects of improvements that expand some restrictions of JPNDISK to parameters concerning NDISK, NSTEP and numbers of zeros of bessel function are also described. (author).

1570 (KEK-PROC–93-10, pp. 199-201) **Development of X-band high power pulsed klystrons.** Odagiri, J. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Mizuno, H.; Higo, T.; Yonezawa, H.; Yamaguchi, N. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A 30MW X-band (11.424GHz) pulsed klystron (XB50K) has been tested up to a peak power of 26MW with a pulse duration of 50ns at a beam voltage of 470kV. A 100MW X-band pulsed klystron (XB72K) has been tested up to a peak power of 79MW with a pulse duration of 50ns at a beam voltage of 580kV. (author).

1571 (KEK-PROC–93-10, pp. 202-205) **High-power test of a prototype of power supplies for UHF klystrons.** Kawamura, M. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Anami, S.; Ono, M.; Kudo, K.; Kubo, T.; Kubota, C.; Takasaki, E.; Takenaka, T.; Kihara, M. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Modurating-anode type UHF klystrons will be used as rf power sources for an RFQ linac and drift-tube-linacs (DTL) in the JHP. We designed and constructed a prototype of the power supplies which provide high-voltage pulse power to the klystrons. A high-power test of the prototype was carried out using a UHF klystron (THOMSON TH2134) as a load. In this report, the test results are described. (author).

1572 (KEK-PROC–93-10, pp. 206-209) **Upgrade of the PF linac klystron modulator for the KEK B-factory project.** Honma, Hiroyuki (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Shidara, Tetsuo; Nakao, Katsumi; Michizono, Shinichiro; Anami, Shozo. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

In the microwave source of the PF linac, two modulators were modified for doubling the output power required for B-factory. We have carried out full-rate high power test using them as well as 50 MW klystron. In this report, an outline of the modulator modification and the results of high power tests are described. (author).

1573 (KEK-PROC–93-10, pp. 210-214) **Development of an X-band klystron modulator using a pulse-forming line and magnetic switch.** Akemoto, Mitsuo (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Takeda, Seishi. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A new type of klystron modulator has been developed for the Japan Linear Collider. It consists of a pulse-forming line (PFL), a pulse transformer and a magnetic switch. In order to realize a compact modulator, a triplate strip transmission line using deionized water as a dielectric was adapted for the PFL. A preliminary test has shown that an output pulse with a peak voltage of 600 kV, a pulse length (flat-top) of 420 ns and a rise time of 154 ns can be generated for a dummy load with an impedance of 450 Ω. (author).

1574 (KEK-PROC–93-10, pp. 215-218) **Production and high power test of an S-band SLED with dual side-wall coupling irises.** Suzuki, Kunio (Nihon Koshuha Co. Ltd., Yokohama (Japan)); Baba, Hitoshi; Shinohara, Kibatsu; Miura, Atsushi; Matsumoto, Hiroshi; Yamaguchi, Seiya. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

An S-band SLED Cavity with two coupling irises has been produced by Nihon Koshuha Co. Ltd. After the 500h, the input power was increased up to 80MW with 4.5μs pulse width. It was successfully operated at an output rf-power of 380MW with 1μs pulse width without any serious breakdown problem. (author).

1575 (KEK-PROC–93-10, pp. 219-221) **Upgrade of the RF source for PF linac by pulse compression.** Hanaki, Hirofumi (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Anami, Shozo; Enomoto, Atsushi; Otake, Yuji; Michizono, Shinichiro; Yamaguchi, Seiya. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A design for the SLED system of the B factory injector linac is described. The first beam acceleration test using the SLED was carried out. An energy multiplication factor of 1.89 was obtained. (author).

1576 (KEK-PROC–93-10, pp. 222-224) **Development of recirculating RF pulse compression system.** Yamaguchi, Seiya (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Enomoto, Atsushi; Anami, Shozo; Hanaki, Hirofumi; Otake, Yuji; Sato, Isamu. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

An RF pulse compression technique using recirculating resonant cavity is under development for accelerating energy reinforcement for KEK B-factory. Cavity design and fabrication of cold model are described. (author).

1577 (KEK-PROC–93-10, pp. 225-227) **Design of an RF window for L-band CW klystron based on thermal-stress analysis.** Yamaguchi, Seiya (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Sato, Isamu; Konashi, Kenji; Ohshika, Junji. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

Design of klystron RF window has been performed based on a thermal-stress analysis for L-band CW electron linac for nuclear wastes transmutation. It was shown that the hoop stress for a modified disk is 46% of that of normal disk. Thermal load test has been done which indicated that the modified disk is proof against power twice as much as that for the normal disk. (author).

1578 (KEK-PROC–93-10, pp. 228-230) **High power test of L-band RF window using resonant ring.** Hirano, K. (Power Reactor and Nuclear Fuel Development Corp., Oarai, Ibaraki (Japan). Oarai Engineering Center); Emoto, T.; Toyama, S. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting,

Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

A pillbox RF output window of the L-band CW klystron has been designed and tested, which will be used for PNC 10MeV CW high power electron linac. The RF window withstands to 1.7MW CW and 4.5MW pulse (4ms long, 50Hz repetition). (author).

1579 (KEK-PROC–93-10, pp. 231-234) **Application of traveling-wave type RF window in L and S bands.** Takeuchi, Yasunao (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)). National Lab. for High Energy Physics. Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

The traveling-wave type RF window, which was proposed by Kazakov, has no standing wave in the window ceramic and the electric field strength in the window ceramic is lower than the conventional one. Therefore it can handle higher RF power than the conventional one. We analyzed matching solutions of traveling-wave type windows (pillbox type) comparing with conventional ones by using Smith chart. Examples of the window in L and S bands are showed and discussed. (author).

1580 (KEK-PROC–93-10, pp. 235-239) **Development of an S-band RF window for linear colliders.** Miura, A. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Matsumoto, H. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

We report on our research and development of an S-band (2856 MHz) alumina RF window for a high power transmission which exceeds 100 MW. In order to reduce binder materials such as MgO and internal voids, we have developed on techniques of sintering high purity (99.9%) alumina disks without MgO and treating them with a Hot Isostatic Pressing (HIP) method. An experiment at a resonant ring has shown that the new RF window based on this technique can successfully withstand a maximum transmission-power of 300 MW with pulse width 2.5 μs at 50 Hz. (author).

1581 (KEK-PROC–93-10, pp. 240-242) **Development of the S-band high power RF load. 3.** Morita, S. (ATC Co. Ltd., Hachioji, Tokyo (Japan)); Matsumoto, H.; Miura, A. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

An SiC type microwave dummy load is under development for the ATF S-band injector LINAC. A final goal of the dummy load has to reach input power of up to 50 MW, 1 μsec pulse width and repetition rate of 50 pps. The 60 cm-long low-power load obtained the input VSWR of 1.09 at 2.856 GHz. (author).

1582 (KEK-PROC–93-10, pp. 243-246) **The solid-state rf power amplifier for accelerator.** Satoh, Kazuyuki (Nihon Koshuha Co. Ltd., Yokohama (Japan)); Nagatsuka, Kenji; Matsumoto, Hirofumi; Kashiwagi, Atsushi; Baba, Hitoshi; Shinohara, Kibatsu. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Aug 1993. (In Japanese). (CONF-9307187–: 18. linear accelerator meeting, Tsukuba (Japan), 21-23 Jul 1993). In *Proceedings of the 18th linear accelerator meeting in Japan.* 471p. Order Number DE94777550. Source: OSTI; NTIS; INIS.

An 10 kW high power solid-state amplifier has been developed by combining the modules of rf power level $\approx$100 W. The used 16-way multi combiner was the most important point to make the above system such as simple, compact and low cost. In this report, we describe the process of production and the performance about it. (author).

1583 (LAPP-EXP–93-04) **The second level trigger of the L3 experiment. Pt. 1: The implementation.** Bertsch, Y.; Blaising, J.J.; Bonnefon, H.; Chollet-Le Flour, F.; Degre, A.; Dromby, G.; Lecoq, J.; Morand, R.; Moynot, M.; Perrot, G.; Riccadonna, X. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Jul 1993. [30p.] Order Number DE95606428. Source: OSTI; NTIS (US Sales Only); INIS.

The second level trigger of the L3 experiment performs online background rejection and reduces the first level trigger rate to a value fitting with the third level trigger processing capability. Designed around a set of 3 bit-slice XOP microprocessors, it can process up to 500 first level triggers per second without significant dead time in the data acquisition. The system described here ensures the L3 data taking since the beginning of LEP in July 1989 and the online rejection since 1990. (authors). 24 refs., 8 figs., 3 tabs.

1584 (LAPP-EXP–93-05) **The second level trigger of the L3 experiment. Pt. 2: The event selection.** Beingessner, S.P. (Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires); Blaising, J.J.; Chollet-Le Flour, F.; Degre, A.; Dromby, G.; Goy, C.; Lecoq, J.; Morand, R.; Moynot, M.; Perrot, G.; Rosier-Lees, S.; Forconi, G. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Jul 1993. 14p. Order Number DE95606429. Source: OSTI; NTIS (US Sales Only); INIS.

The events recorded by the L3 Data Acquisition System are selected by three levels of trigger. The event filtering performed by software at the second trigger level is described. First coded offline in FORTRAN, the filtering software is microcoded for online execution in a farm of 3 XOP processors operating in a round robin mode. It identifies and rejects background events. Depending on running conditions and trigger type, rejection factors ranging from 45% to 80% are obtained on first level energy, muon and tec triggers. Selection efficiencies greater than 99.95% are achieved. (authors). 14 refs., 3 figs., 2 tabs.

1585 (LAPP-EXP–93-10) **The slow proton position-sensitive time of flight detector of the GAMS NA12/2 experiment at CERN.** Donskov, S.V. (Institute for High Energy Physics, Protvino (Russian Federation)); Binon, F.G.; Alde, D.; Boutemeur, M.; Bellazzini, R.; Inaba, S.; Kinash, T. GAMS NA12/2 Collaboration. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Nov 1993. 16p. Order Number DE95606430. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods (NL).

The GAMS NA12/2 programme is a fixed CERN target experiment. It looks for new mesons or exotic states which are centrally produced by 450 GeV/c protons. A large time of flight detector has been built by the GAMS NA12/2 experiment at CERN. It surrounds a 60 cm long liquid hydrogen target. With a time resolution better than σ = 350 ps, pion/proton separation is achieved up to a 800 MeV/c momentum. (authors). 5 refs., 16 figs.

1586 (LA-SUB–94-149) **Low-level RF LabVIEW® control software user's manual: Version 1.0.** Los Alamos National Lab., NM (United States); Twente Univ., Enschede (Netherlands). Jun 1992. 108p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001754. Source: OSTI; NTIS; INIS; GPO Dep.

(One-copy to Berta Perez - Software Center).

This document details information on the low-level radio frequency (LLRF) software control package. The chapters in this manual cover the following topics: Chapter one describes the general operating principles of the LabVIEW software package, and also discusses the high-level menu panels which allow access to the individual control panels. Chapter two covers the control panels used for conditioning the cavity, and for controlling the accelerator under normal operating conditions. Chapter three provides information on the resonance detection and reflectometer calibration function, including the setup and status panels for each. Chapter four contain instructions on the use of those panels dedicated to controlling the cavity RF field. Chapter five discusses the control panels that provide setup and status information on the diagnostic monitor subsystem. Chapter six outlines those panels used to control the timing functions provided by the LLRF system. Finally, chapter seven describes the control panels used to monitor and adjust the alarm and limit functions of the system. Throughout the document, it is assumed that the reader has a general working

knowledge of accelerators, high-power amplifier equipment, and low-level RF (LLRF) control systems. References are listed as footnotes as they occur in the text.

1587 (LA-UR–94-3213) **Confirmatory experiments for the United States Department of Energy Accelerator Production of Tritium Program: Neutron, triton and radionuclide production by thick targets of lead and tungsten bombarded by 800 MeV protons.** Lisowski, P.W. (and others); Cappiello, M.; Ullmann, J.L.; Gavron, A.; King, J.D.; Laird, R.; Mayo, D.; Waters, L.; Zoeller, C.; Staples, P. Los Alamos National Lab., NM (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409235–1: DOE/CEA-DAM conference, Paris (France), 12-14 Sep 1994). Order Number DE95000934. Source: OSTI; NTIS; INIS; GPO Dep.

Neutron and Triton Production by 800 MeV Protons: The experiments presented in this report were performed in support of the Accelerator Production of Tritium (APT) project at the Los Alamos Weapons Neutron Research (WNR) facility in order to provide data to benchmark and validate physics simulations used in the APT target/blanket design. An experimental apparatus was built that incorporated many of the features of the neutron source region of the ^{3}He target/blanket. Those features included a tungsten neutron source, flux traps, neutron moderator, lead backstop, lead multiplying annulus, neutron absorbing blanket and a combination neutron de-coupler and tritium producing gas (^{3}He). The experiments were performed in two separate proton irradiations each with approximately 100 nA-hr of 800 MeV protons. The first irradiation was made with a small neutron moderating blanket, allowing the authors to measure tritium production in the ^{3}He gas by sampling, and counting the amount of tritium. The second irradiation was performed with a large neutron moderating blanket (light water with a 1% manganese sulfate solution) that allowed them to measure both the tritium production in the central region and the total neutron production. The authors did this by sampling and counting the tritium produced and by measuring the activation of the manganese solution. Results of the three tritium production measurements show large disagreements with each other and therefore with the values predicted using the LAHET-MCNP code system. The source of the discrepancies may lie with the sampling system or adsorption on the tungsten surfaces. The authors discuss tests that may resolve that issue. The data for the total neutron production measurement is much more consistent. Those results show excellent agreement between calculation and experiment.

1588 (LA-UR–94-3362) **Simulation and steering in the intertank matching section of the ground test accelerator.** Yuan, V.W. (Los Alamos National Lab., NM (United States)); Bolme, G.O.; Johnson, K.F.; Mottershead, C.T.; Sander, O.R.; Smith, M.T.; Erickson, J.L. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410219–2: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95001019. Source: OSTI; NTIS; INIS; GPO Dep.

The Intertank Matching Section (IMS) of the Ground Test Accelerator (GTA) is a short (36 cm) beamline designed to match the Radio Frequency Quadrupole (RFQ) exit beam into the first Drift Tube LINAC (DTL) tank. The IMS contains two steering quadrupoles (SMQs) and four variable-field focussing quads (VFQs). The SMQs are fixed strength permanent magnet quadrupoles on mechanical actuators capable of transverse movement for the purpose of steering the beam. The upstream and downstream steering quadrupoles are labelled SMQ1 and SMQ4 respectively. Also contained in the IMS are two RF cavities for longitudinal matching.

1589 (LA-UR–94-3388) **Noninterceptive transverse emittance measurement diagnostic for an 800 MeV H$^-$ transport line.** Sandoval, D.P. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410219–7: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95002722. Source: OSTI; NTIS; INIS; GPO Dep.

A nonintrusive diagnostic device that will measure the transverse-phase-space parameters of an 800 MeV H$^-$ beam is under development. The diagnostic device will make the measurements under normal operating conditions and will not perturb the particle beam or produce unwanted radiation. The diagnostic will use the phenomenon of laser-induced photodissociation to sample the H$^-$ beam. This paper discusses the preliminary design of the diagnostic device.

1590 (LBL–35844) **Undulators at the ALS.** Hoyer, E. (and others); Akre, J.; Chin, J. Lawrence Berkeley Lab., CA (United States). Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (LSGN–190; CONF-940714–35: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95002335. Source: OSTI; NTIS; INIS; GPO Dep.

At Lawrence Berkeley Laboratory's (LBL) Advanced Light Source (ALS), three 4.6 m long undulators have been completed, tested and installed. A fourth is under construction. The completed undulators include two 5.0 cm period length, 89 period devices (U5.0s) which achieve a 0.85 T effective field at a 14 mm minimum gap and a 8.0 cm period length, 55 period device (U8.0) that reaches a 1.2 T effective field at a 14 mm minimum gap. The undulator under construction is a 10.0 cm period length, 43 period device (U10.0) that is designed to achieve 0.98 T at a 23 mm gap. Undulator magnetic gap variation (rms) is within 25 microns over the periodic structure length. Reproducibility of the adjustable magnetic gap has been measured to be within +/– 5 microns. Gap adjusting range is from 14 mm to 210 mm, which can be scanned in one minute. The 5.1 m long vacuum chambers are flat in the vertical direction to within 0.74 mm and straight in the horizontal direction to within 0.08 mm over the 4.6 m magnetic structure sections. Vacuum chamber base pressures after UHV beam conditioning are. in the mid 10^{-11} Torr range and storage ring operating pressures with full current are in the low 10^{-10} Torr range. Measurements show that the uncorrelated magnetic field errors are 0.23%, and 0.20% for the two U5.Os and the U8.0 respectively and that the field integrals are small over the 1 cm by 6 cm beam aperture. Device description, fabrication, and measurements are presented.

1591 (LBL–35865) **ALS Multiple Trim Magnets, or "Magic Fingers," for insertion device field integral correction.** Hoyer, E.; Marks, S.; Pipersky, P.; Schlueter, R. Lawrence Berkeley Lab., CA (United States). Jul 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (LSGN–188; CONF-940714–34: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95002350. Source: OSTI; NTIS; INIS; GPO Dep.

Multiple Trim Magnets (MTMs), also known as "Magic Fingers", is an arrangement of magnets for reducing integrated magnetic field errors in insertion devices. The idea is to use transverse arrays of permanent magnets, hence the name "Multiple Trim Magnets", above and below the midplane, to correct both normal and skew longitudinal magnetic field integral errors in a device. MTMs are typically installed at the ends of an ID. Adjustments are made by changing either the size, position or orientation of each trim magnet. Application of the MTMs to the ALS undulators reduced both the normal and skew longitudinal field integral errors, over the entire 20 mm by 60 mm "good field region", of the beam aperture by as much as an order of magnitude. The requirements included corrections of field and gradients outside the multipole convergence radius. Additionally, these trim magnet arrays provided correction of the linear component of the integrated field gradients for particles with trajectories not parallel to the nominal beam axis. The MTM concept, design, construction, tests that demonstrated feasibility and magnetic field integral reduction of ALS undulators are presented.

1592 (SAND–94-1911C) **Very high-power electron-beam transport in long gas cells from 10^{-3} to 10^3 Torr N_2.** Sanford, T.W.L. (Sandia National Labs., Albuquerque, NM (United States). Intense Beam Research Dept.). Sandia National Labs., Albuquerque, NM (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941101–1: Meeting of the Division of Plasma Physics of the American Physical Society, Minneapolis, MN (United States),

7-11 Nov 1994). Order Number DE95002611. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements and analyses show that the 13-TW, pulsed Hermes-III electron beam, with current near the Alfven limit, has two regimes of stable transport: a low-pressure window (between ~1 and ~100 mTorr) that is dominated by propagation in the semi-collisionless IFR (ion-focused regime), and a high-pressure window (between ~1 and ~100 Torr) that is dominated by propagation in the resistive CDR (collision-dominated regime). Propagation in both regimes (the IFR at early time and the CDR at later time) is observed from ~10 to ~100 mTorr. Below ~1 mTorr, there is insufficient ionization to confine the beam. As the pressure increases, two-stream instabilities terminate IFR propagation earlier in time. Above 10 mTorr, this instability is sufficiently quenched by gas collisions that CDR propagation in the beam body occurs. Above ~100 mTorr, the gas breaks down too rapidly for a significant IFR pulse to form, and for higher pressures only a single pulse in the CDR is propagated. Between ~100 mTorr and ~1 Torr, however, the hollowing instability and lack of magnetic confinement limit CDR propagation, and above ~100 Torr, the resistive hose instability again degrades propagation.

1593 (SLAC-PUB–6535) **RF feedback simulation for the PEP-II B Factory.** Tighe, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jun 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-940618–83: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95001489. Source: OSTI; NTIS; INIS; GPO Dep.

A model, of the beam and RF system for PEP-11 has been developed to allow both time-domain simulation and frequency-domain analysis of the complete system. The model includes the full set of feedback loops and nonlinear elements such as the beam and klystron. The model may be used to predict beam and feedback stability in the presence of nonlinearities through time-domain simulation as well as system frequency response about a given operating point.

1594 (SLAC-PUB–6677) **The design and performance of 150-MW S-band klystrons.** Sprehn, D.; Phillips, R.M.; Caryotakis, G. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Sep 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-941217–1: International electron devices meeting: annual technical meeting of the Electron Devices Society of the Institution of Electrical and Electronics Engineers, San Francisco, CA (United States), 11-14 Dec 1994). Order Number DE95001849. Source: OSTI; NTIS; INIS; GPO Dep.

As part of an international collaboration, the Stanford Linear Accelerator Center (SLAC) klystron group has designed, fabricated and tested a 60 Hz, 3 μs, 150 MW klystron built for Deutsches Elektronen Synchrotron (DESY). A test diode with a 535 kV, 700 A electron beam was constructed to verify the gun operation. The first klystron was built and successfully met design specifications. This paper discusses design issues and experimental results of the diode and klystron including the suppression of gun oscillations.

1595 (SLAC-PUB–6690) **Mode selective directional coupler for NLC.** Tantawi, S.G. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Oct 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-930511–521: PAC '93: international particle accelerator conference, Washington, DC (United States), 17-20 May 1993). Order Number DE95001707. Source: OSTI; NTIS; INIS; GPO Dep.

The design method for a high power, X-band, 50 dB, circular to rectangular directional coupler is presented. The circular guide is over moded and is intended to operate in TE_{01} mode. The rectangular guide operates at the fundamental TE_{10} mode. A small percentage of higher order modes in the circular guide can cause considerable errors in the measurements because the magnitude of the axial magnetic field of these modes is higher than that of the operating mode, especially near their cutoff. We used a Hamming window patten for the coupling slots to achieve mode selectivity. Comparison of theory and experiment will be presented.

1596 (SSCL–649) **Feasibility study of aluminum beam tube for the collider: An option for no-coating and no-liner.** Chou, W. Superconducting Super Collider Lab., Dallas, TX (United States). Jul 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95002105. Source: OSTI; NTIS; INIS; GPO Dep.

This report proposes to use a single-layer beam tube made of high strength, high resistivity aluminum alloy (such as 7039-T61 or A7N01) to replace the double-layer copper coated stainless steel tube in the SSC Collider. The main reasons are: (1) a potential saving of about $23 million which is basically the baseline cost of the copper coating and (2) the use of an extruded aluminum tube consisting of a beam chamber and a pumping chamber may solve the vacuum problem without any liner.

1597 (SSCL–676) **Implementation of Beam-Loss Monitor systems for the SSC.** Johnson, R.G. Superconducting Super Collider Lab., Dallas, TX (United States). Jul 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95002103. Source: OSTI; NTIS; INIS; GPO Dep.

Beam-Loss Monitors (BLM) are used with each accelerator in the Superconducting Super Collider complex. The primary purpose of these detectors is to protect the accelerators from damage due to the loss of protons. Although the range of primary beam energies to be covered is very large, 20 MeV to 20 TeV, we plan to maintain commonality of detectors and electronics as much as possible. In this report the plans for developing and implementing BLM systems for each of the accelerators will be discussed. Possible solutions to problems that have been identified are presented.

1598 (SSCL–679) **Activation concentrations outside the SSC accelerator enclosures.** Baker, S.; Bull, J.; Stapleton, G. Superconducting Super Collider Lab., Waxahachie, TX (United States). Oct 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95002101. Source: OSTI; NTIS; INIS; GPO Dep.

Activation of groundwater due to beam loss at the Superconducting Super Collider (SSC) is discussed, with activation criteria and models presented. Estimates are given of maximum beam losses allowed in the various accelerators of the SSC to meet federal drinking water standards, assuming no additional shielding is provided.

1599 (SSCL–688) **Final report of the SSC electrodesorption studies.** Maschke, A. Superconducting Super Collider Lab., Dallas, TX (United States). Oct 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95002102. Source: OSTI; NTIS; INIS; GPO Dep.

Electrodesorption studies at the Superconducting Super Collider (SSC) were part of a larger program to try to understand what would be going on inside the SSC beam tube–for example, how much of the beam tube surface would be exposed to desorbing radiation. Since the incident synchrotron radiation lands on a few-millimeter-wide strip along the beam tube, it is possible that only a very small fraction of the surface would be exposed if the radiation were largely absorbed without rescatter. Therefore, we wanted information about scattering and absorption from various candidate surfaces. The earlier electroplating studies that were carried out by the Central Design Group emphasized high values of the conductivity at 4 K. We wanted to find out if there were other electroplating techniques that might give adequate conductivity but a smaller cross section for hydrogen desorption. This would include looking for other coatings that might reduce the desorption. Gold was often suggested as a possibility.

1600 (SSCL–689) **Impedance measurements of the LEB extraction kicker magnet.** Walling, L. Superconducting Super Collider Lab., Waxahachie, TX (United States). Oct 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC35-89ER40486. Order Number DE95002099. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides results of longitudinal and transverse impedance measurements of the Low Energy Booster (LEB) Extraction Kicker Magnet of the Superconducting Super Collider (SSC). The kicker magnet was designed to steer the beam upon

extraction from the LEB into the septum magnets, requiring a vertical angular deflection of 1.5 mrad. This magnet would have been required to generate an integrated field of 0.06 T-m for 2 μs, rising from 1% to 99% of peak in $\leq$ 80 ns.

4304 Storage Rings

Refer also to citation(s) 1528, 1530, 1655

1601 (DESY–94-103) **The proton collimation system of HERA.** Seidel, M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany); Hamburg Univ. (Germany). Fachbereich 12 - Physik. Jun 1994. 115p. Order Number DE95715137. Source: OSTI; NTIS (US Sales Only); INIS.

Proton induced background limits the efficiency of the detectors in the electron-proton collider HERA. A large fraction of the background stems from halo-protons which hit aperture restrictions at certain positions in the ring. This thesis is concerned with the two stage collimation system in HERA-p which is supposed to suppress this kind of background. The absorption efficiency of a single collimator jaw is mostly determined by the impact parameter of the incident protons. The impact parameter is the distance from the edge at which the jaw is hit. The size of this critical parameter is estimated with analytical considerations and with numerical tracking methods based on measured diffusion rates in the beam halo. Under typical HERA conditions one expects a value of about 1 μm. This small size of the mean impact parameter causes a high probability that a particle is elastically scattered and reenters the beam. In order to intercept these scattered particles one uses secondary collimators in HERA. General rules for the optimum positioning of the secondary collimators with respect to the primary collimator in a given machine optics are evaluated. The total efficiency of the presently used collimation system and of alternative set-ups is investigated with Monte-Carlo methods. On the other hand practical experience with the system is presented. Beside some general observations, measurements of background rates at the HERA-detectors are shown as a function of the collimator positions. The HERA-p collimation system consists of 12 movable tungsten jaws at three locations in the ring. A manual operation of the system is therefore rather time consuming and dangerous in the case of an operational mistake. The development of partially automised controls for the system is therefore an important topic of this thesis also. In order to control the precise positioning of the jaws at the beam edge the induced hadronic showers are monitored immediately downstream the collimators.

1602 (DESY–94-119) **Test of internal halo targets in the HERA proton ring.** Hast, C. (Dortmund Univ. (Germany). Inst. fuer Physik); Ehret, K.; Hofmann, W.; Khan, S.; Knoepfle, K.T.; Reber, M.; Rieling, J. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1994. 43p. Order Number DE95715136. Source: OSTI; NTIS (US Sales Only); INIS.

Internal wire targets in the halo of stored proton beams provide a line source of proton-nucleus interactions for highest-rate fixed target experiments. We have studied such internal halo targets at the 820 GeV proton ring of the HERA ep collider. The tests showed that most of the protons in the beam halo - which would otherwise hit the collimators - can be brought to interaction in a relatively thin target wire at distances of 7 to 8 beam widths from the center of the beam. At less than 10% of the HERA total design current, and less than 20% of the current per bunch, interaction rates up to 8 MHz were observed, corresponding to more than 2 interactions per bunch crossing. The halo targets were used in parallel to the HERA luminosity operation; no significant disturbances of the HERA ep experiments, of the machine stability or beam quality were observed. We present data on the steady-state and transient behaviour of interaction rates and discuss the interpretation in terms of a simple beam dynamics model. Issues of short-, medium- and long-term rate fluctuations and of rate stabilization by feedback are addressed. (orig.)

1603 (GSI–94-05) **Production and study of pulsed heavy-Ion beams of highest phase-space density in the GSI experimental storage ring.** Kalisch, G. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); Technische Hochschule Darmstadt (Germany). Fachbereich 18 - Elektrische Nachrichtentechnik. Jan 1994. 120p. (In German). Order Number DE95716231. Source: OSTI; NTIS (US Sales Only); INIS.

Aim of the present thesis was the production of intense, bunched heavy-ion beams for the high temperature measurement place of the GSI. The main topics layed hereby both on the study of collective effects in space-charge dominated, stationary bunches in the ESR, and on the implementation of a procedure for the compression of weakly bunched beams. All considerations concentrated hereby exclusively on the longitudinal phase space with the attempt to minimize the pulse duration of the beams available for target experiments. By means of the experimental results the flattening of the external RF potential in space-charge dominated bunches predicted by the analytical model of the envelope equation could be confirmed. Especially the evaluation of longitudinal Schottky spectra permitted the observation of the reduced, incoherent synchrotron frequency, as well as the splitting of the coherent multipole modes. Furthermore it could be shown that the separation of the synchrotron satellites is farly independent on the shape of the considered distribution function and represents a direct measure for their phase-space density.

1604 (LBL–35535) **A multiple objective magnet sorting algorithm for the ALS insertion devices.** Humphries, D. (Lawrence Berkeley Lab., CA (United States). Advanced Light Source); Goetz, F.; Kownacki, P.; Marks, S.; Schlueter, R. Lawrence Berkeley Lab., CA (United States). Jul 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (LSGN–191; CONF-940714–33: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95002349. Source: OSTI; NTIS; INIS; GPO Dep.

Insertion devices for the Advanced Light Source (ALS) incorporate large numbers of permanent magnets which have a variety of magnetization orientation errors. These orientation errors can produce field errors which affect both the spectral brightness of the insertion devices and the storage ring electron beam dynamics. A perturbation study was carried out to quantify the effects of orientation errors acting in a hybrid magnetic structure. The results of this study were used to develop a multiple stage sorting algorithm which minimizes undesirable integrated field errors and essentially eliminates pole excitation errors. When applied to a measured magnet population for an existing insertion device, an order of magnitude reduction in integrated field errors was achieved while maintaining near zero pole excitation errors.

1605 (LBL–35843) **Advanced Light Source elliptical wiggler.** Hoyer, E. (Lawrence Berkeley Lab., CA (United States). Advanced Light Source); Akre, J.; Humphries, D.; Marks, S.; Minamihara, Y.; Pipersky, P. Lawrence Berkeley Lab., CA (United States). Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (LSGN–189; CONF-940714–32: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95002356. Source: OSTI; NTIS; INIS; GPO Dep.

A 3.5m long elliptical wiggler, optimized to produce elliptically polarized light in the 50 eV to 10 keV range, is currently under design and construction at the Advanced Light Source (ALS) at Lawrence Berkeley Laboratory. Calculations of spectral performance show that the flux of circularly polarized photons exceeds 10^{13} photons/sec over the 50 eV to 10 keV operating range for current of 0.4 amps and 1.5 GeV electron energy. This device features vertical and horizontal magnetic structures of 14 and $14\frac{1}{2}$ periods respectively. The period length is 20.0 cm. The vertical structure is a hybrid permanent magnet design with tapered pole tips that produce a peak field of 2.0 T. The horizontal structure is an iron core electromagnetic design, shifted longitudinally $\frac{1}{4}$ period, that is tucked between the upper and lower vertical magnetic structure sections. A maximum peak oscillating field of 0.095 T at a frequency up to 1 Hz will be achieved by excitation of the horizontal poles with a trapezoidal current waveform. The vacuum chamber is an unconventional design that is removable from the magnetic structure, after magnetic measurements, for UHV processing. The chamber is fabricated from non-magnetic stainless steel to minimize the effects of eddy currents. Device design is presented.

1606 (LBL–36064) **A storage ring for radioactive beams.** Moltz, D.M. Lawrence Berkeley Lab., CA (United States). May 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-940261–2: ISAC workshop, Lake Louise (Canada), 17-21 Feb 1994). Order Number DE95002330. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary ideas are presented for the scientific justification of a storage ring for radioactive beams. This storage ring would be suitable for many nuclear and atomic physics experiments. Ideally, it would be constructed and tested at an existing low-energy heavy-ion facility before relocation to a major radioactive beam facility.

1607 (LBL-PUB–3123) **Advanced Light Source: Users' Handbook.** Lawrence Berkeley Lab., CA (United States). Oct 1994. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002353. Source: OSTI; NTIS; GPO Dep.

The ALS Users' Handbook is designed to help you prepare for your visit to the ALS, to assist you in getting your experiments underway, and to act as a resource to the facilities and services available at the ALS and LBL. We hope it encompasses "what you need to know" to make your stay at the ALS productive and enjoyable. The handbook contains six sections. Sections 1 and 2 explain how to become a user of the ALS and contain important information users need to know before arriving at the ALS. All ALS users are encouraged to read this part of the handbook well in advance of their planned visit to the ALS. Sections 3 and 4 describe general information about organizational structure and access to the ALS, and describe the facilities and describe the facilities and services offered at the ALS an LBL. Section 5 lists some fun things to see and do in the Berkeley area including museums, parks, and sports facilities. Section 6 contains reference information.

1608 (SLAC-PUB–6517) **Algorithms for orbit control on SPEAR.** Corbett, J. (Stanford Univ., CA (United States). Stanford Synchrotron Radiation Lab.); Keeley, D.; Hettel, R.; Linscott, I.; Sebek, J. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Stanford Univ., CA (United States). Stanford Synchrotron Radiation Lab. Jun 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (SLAC/SSRL–0077; CONF-940618–90: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002868. Source: OSTI; NTIS; INIS; GPO Dep.

A global orbit feedback system has been installed on SPEAR to help stabilize the position of the photon beams. The orbit control algorithms depend on either harmonic reconstruction of the orbit or eigenvector decomposition. The orbit motion is corrected by dipole corrector kicks determined from the inverse corrector-to-bpm response matrix. This paper outlines features of these control algorithms as applied to SPEAR.

1609 (SLAC-PUB–6533) **Multipole contribution from an off-axis orbit in an IR quadrupole and the consequences on the dynamic aperture.** Sullivan, M. (California Univ., Stanford, CA (United States). Intercampus Inst. for Research at Particle Accelerators); Caspi, S.; Forest, E. Stanford Linear Accelerator Center, Menlo Park, CA (United States); California Univ., Stanford, CA (United States). Intercampus Inst. for Research at Particle Accelerators; Lawrence Berkeley Lab., CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ; AS03-76ER70285 ; AC03-76SF00098. (LBL–35911; CONF-940618–96: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002874. Source: OSTI; NTIS; INIS; GPO Dep.

The low-energy beam of the proposed PEP-II B factory enters the first quadrupole (Q1) after the interaction point off axis in order to separate the low-energy beam from the high-energy beam. The off-axis beam orbit in Q1 gives rise to significant feed-down terms from higher multipoles that originate from systematic effects and random fabrication errors. The authors study superconducting and permanent magnet designs of Q1, and look at the effect these different designs have on the dynamic aperture. Including a dipole field in a superconducting design allows one to offset the magnetic axis from the mechanical axis, thereby maintaining the separation of the beams while greatly reducing the feed-down effect. They illustrate relevant points of the discussion with tracking results for the PEP-II low-energy ring.

1610 (SLAC-PUB–6539) **RF system design for the PEP-II B Factory.** Schwarz, H. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Rimmer, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Lawrence Berkeley Lab., CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ; AC03-76SF00098. (LBL–35797; CONF-940618–98: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002876. Source: OSTI; NTIS; INIS; GPO Dep.

The paper presents an overview of the design of the RF system for the PEP-II B Factory. An RF station consists of either two or four single-cell cavities driven by a 1.2 MW klystron through a waveguide distribution network. A variety of feedback loops stabilize the RF and its interaction with the beam. System parameters and all the relevant parameters of klystron and cavities are given.

1611 (SLAC-PUB–6540) **RF Feedback Analysis for 4 cavities per klystron in PEP-II.** Corredoura, P.; Tighe, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-940618–99: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002877. Source: OSTI; NTIS; INIS; GPO Dep.

Lattice changes in the PEP-II high energy ring have made the concept of driving four cavities with a single klystron an attractive option. This paper examines the topology from a RF feedback point of view. Sources of error are identified and their magnitudes are estimated. The effect on the performance of the longitudinal impedance reducing feedback loops is calculated using control theory and Mathematica.

1612 (SLAC-PUB–6548) **Operation and performance of a longitudinal damping system using parallel digital signal processing.** Fox, J.D. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Hindi, H.; Linscott, I. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Lawrence Berkeley Lab., CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ; AC03-76SF00098. (LBL–35913; CONF-940618–103: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002881. Source: OSTI; NTIS; INIS; GPO Dep.

A programmable longitudinal feedback system based on four AT&T 1610 digital signal processors has been developed as a component of the PEP-II R&D program. This Longitudinal Quick Prototype is a proof of concept for the PEP-II system and implements full speed bunch-by-bunch signal processing for storage rings with bunch spacings of 4 ns. The design implements, via software, a general purpose feedback controller which allows the system to be operated at several accelerator facilities. The system configuration used for tests at the LBL Advanced Light Source is described. Open and closed loop results showing the detection and calculation of feedback signals from bunch motion are presented, and the system is shown to damp coupled-bunch instabilities in the ALS. Use of the system for accelerator diagnostics is illustrated via measurement of injection transients and analysis of open loop bunch motion.

1613 (SLAC-PUB–6552) **Broad-band, multi-kilowatt, vacuum, HOM waveguide loads for the PEP-II RF cavity.** Pendleton, R. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Ko, K.; Ng, C.; Schwarz, H.; Corlett, J.; Johnson, J.; Rimmer, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Lawrence Berkeley Lab., CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (LBL–35795; CONF-940618–104: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002882. Source: OSTI; NTIS; INIS; GPO Dep.

For the HOM damping waveguides in the PEP-II RF cavity to work effectively as high-pass filters a broad-band, low-reflection, load is required with a VSWR less than 2:1 in the frequency range 700 MHz to 2500 Mhz. Additional design constraints are vacuum operation, thus eliminating an RF window and a potential source of reflections, and the capability of dissipating up to 10 kill of HOM power. A compact baseline design using a lossy dielectric is proposed which fulfills these requirements based on results from numerical simulations. We present the electrical properties of such a load, discuss its thermal properties under high power conditions, and detail a fabrication technique for brazing the lossy dielectric onto the copper walls of the HOM waveguide. Finally, simulation results of an alternative design utilizing ferrites are presented.

1614 (SLAC-PUB–6553) **High-power RF window design for the PEP-II B Factory.** Neubauer, M. (Stanford Linear Accelerator Center, Menlo Park, CA (United States)); Hodgson, J.; Ng, C.; Schwarz, H.; Skarpaas, K.; Kroll, N.; Rimmer, R. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Lawrence Berkeley Lab., CA (United States); California Univ., San Diego, La Jolla, CA (United States). Jun 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ; AC03-76SF00098 ; FG03-93ER40759. (LBL–35920; CONF-940618–105: 4. European particle accelerator conference, London (United Kingdom), 27 Jun - 1 jul 1994). Order Number DE95002883. Source: OSTI; NTIS; INIS; GPO Dep.

We describe the design of RF windows to transmit up to 500 kW CW to the PEP-II 476 MHz cavities. RF analysis of the windows using high-frequency simulation codes are described. These provide information about the power loss distribution in the ceramic and tim matching properties of the structure. Finite-element analyses of the resulting temperature distribution and thermal stresses are presented. Fabrication methods including a proposed scheme to compensate for thermal expansion s are discussed and hardware tests to validate this approach are described. The effects of surface coatings (intentional and otherwise) and the application of air cooling are considered.

44 INSTRUMENTATION

4401 Radiation Instrumentation

Refer also to citation(s) 258, 588, 602, 603, 604, 605, 741, 1269, 1282, 1336, 1548, 1942, 2029, 2155, 2341, 2539

1615 (AREAEE–296) **Some aspects on neutron dosimetry.** Henaish, B.A.; Youssef, S.K. Nuclear Research Centre, Inshas (Egypt). 1988. 18p. Order Number DE95606664. Source: OSTI; NTIS (US Sales Only); INIS.

The American National Council on Radiation Protection and measurements (1) has recently issued a statement regarding dose limitation system for neutrons. The changes proposed in that statement presented substantial problems regarding the personnel exposure to neutrons and had pointed out the need to reassess an adequate current neutron dosimetry practice. Generally, the same types of dosimeters i.e. Nuclear Track (NTA films) and TLD-Albedo, have been used at major nuclear facilities over the past 15 years. here recently, other dosimetry methods such as track etch with polycarbonates such as CR-39 have been developed. However these should be recognized as local systems aiming to the development of better and more applicable dosimeters. 4 tab.

1616 (BNL–60905) **Influence of oxidation on radiation hardness of silicon detectors.** Kraner, H.W. (Brookhaven National Lab., Upton, NY (United States)); Li, Z.; Lazanu, S.; Biggeri, U.; Borchi, E.; Bruzzi, M. Brookhaven National Lab., Upton, NY (United States). Dec 1993. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9307163–4: 1. international conference on large scale applications and radiation hardness of semiconductor detectors, Florence (Italy), 7-9 Jul 1993). Order Number DE95002466. Source: OSTI; NTIS; INIS; GPO Dep.

The energy levels induced by fast neutron irradiation in high energy silicon detectors produced by different oxidations are analyzed, utilizing TSC measurements and a method of deconvolution of the compound experimental spectrum. Conclusions are drawn regarding the influence of the temperature and ambient during oxidation on their radiation hardness.

1617 (BNL–60935) **Semiconductor detectors in nuclear and particle physics.** Rehak, P. (Brookhaven National Lab., Upton, NY (United States)); Gatti, E. Brookhaven National Lab., Upton, NY (United States). [1992]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9202140–2: 6. European symposium on semiconductor detectors: new developments on radiation detectors, Milan (Italy), 24-26 Feb 1992). Order Number DE95002418. Source: OSTI; NTIS; INIS; GPO Dep.

Semiconductor detectors for elementary particle physics and nuclear physics in the energy range above 1 GeV are briefly reviewed. In these two fields semiconductor detectors are used mainly for the precise position sensing. In a typical experiment, the position of a fast charged particle crossing a relatively thin semiconductor detector is measured. The position resolution achievable by semiconductor detectors is compared with the resolution achievable by gas filled position sensing detectors. Semiconductor detectors are divided into two groups: Classical semiconductor diode detectors and semiconductor memory detectors. Principles of the signal formation and the signal read-out for both groups of detectors are described. New developments of silicon detectors of both groups are reported.

1618 (DESY–93-123C, pp. 235-242) **Experimental requirements for the study of electroweak gauge bosons.** Forty, R.W. (CERN, Geneva (Switzerland)); Hansen, J.B.; Hansen, J.D.; Settles, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The authors describe the requirement for a detector for a linear collider with c. m. energies from 500 to 1000 GeV. Especially they consider the study of the process $e^+e^- \rightarrow W^+W^- \rightarrow q$ anti $q' l\nu_l (l=\mu,e)$. (HSI)

1619 (DESY–93-123C, pp. 521-524) **Deep inelastic eγscattering, with beamsstrahlung.** Miller, D.J. (Physics and Astronomy, Univ. Coll., London (United Kingdom)); Kennedy, B.W.; Ward, J.J.; Forshaw, J.R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication PHOTON-ELECTRON INTERACTIONS/ deep inelastic scattering; LINEAR COLLIDERS/counting techniques; COUNTING TECHNIQUES/photon-electron interactions; ELECTRON-POSITRON INTERACTIONS; INELASTIC SCATTERING; GEV RANGE 100-1000; COLLIDING BEAMS; ELECTRON BEAMS; POSITRON BEAMS; BREMSSTRAHLUNG; SMALL ANGLE SCATTERING

1620 (DESY–93-123C, pp. 591-602) **Machine, physics and detector (plus final focus) interplay at the next e^+e^- linear collider.** Settles, R. (Max-Planck-Inst. fuer Physik, Werner Heisenberg Inst., Muenchen (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

A short overview is given of the requirements placed by the physics on the detectors and the machine at the new e^+e^- linear collider. The main conclusions are that, considering the physics between 300 GeV and 2 TeV, having at least two complementary detectors is desirable if not necessary. For the physics at 300-500 GeV, a LEP or SLC-style detector is quite good for a discovery

phase involving $10fb^{-1}$ of data per year. For higher luminosity running involving $100fb^{-1}$ of data per year, complementary detectors are needed to accomodate the broad physics program. Any new detectors built should be able to handle higher energies and higher luminosities. These are also important requirements for the choice of machine technology, that the $\sqrt{s}$ be expandable to $\approx$ 1 - 2 TeV, and that it should be able to achieve $10^{34}cm^{-2}s^{-1}$. Also the ability to produce highly polarized beams adds an important dimension to the physics program. The luminosity spectrum as a function of $\sqrt{s}$ must be well-calibrated. (orig.)

1621 (DOE/NV/11502–T2) **Mercuric iodide research and development in support of DOE Historically Black Colleges and University Program: Semiannual technical progress report.** George, M.A.; Zheng, Y.; Salary, L.; Chen, K.T.; Burger, A. Fisk Univ., Nashville, TN (United States). Dept. of Physics. 31 Oct 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG08-94NV11502. Order Number DE95002197. Source: OSTI; NTIS; GPO Dep.

This report describes the progress achieved during the first six months of the program. The different subjects studied were: zone refining experiments of mercuric iodide to establish optimum refining parameters and produce purified material; development of surface reflection spectroscopy as a method to measure crystal surface temperatures, with emphasis on investigation the potential of using optical multichannel analysis; optical methods for measuring iodine vapor during physical vapor transport of HgI_2; and atomic force microscopy studies.

1622 (FNAL/C–94/281-E) **Data acquisition for the CDF SVX II upgrade.** Gold, M. (New Mexico Univ., Albuquerque, NM (United States)). CDF SVX II Group. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–44: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002533. Source: OSTI; NTIS; INIS; GPO Dep.

CDF is developing a second generation silicon vertex detector for the Fermilab Tevatron Run II. In order to exploit the high luminosity of the Fermilab Main Injector, the data acquisition system is being designed to accept high trigger rates and accommodate a secondary vertex trigger.

1623 (FNAL/C–94/284-E) **The E781 trigger and data acquisition system.** Engelfried, J. E781 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9406242–5: Workshop on the future of high sensitivity charm experiments, Batavia, IL (United States), 7-9 Jun 1994). Order Number DE95002249. Source: OSTI; NTIS; INIS; GPO Dep.

The trigger and data acquisition system of Fermilab Experiment 781 (SELEX), a high statistics charm baryon experiment scheduled to run in the next Fermilab fixed target run in 1996, is briefly described. The first and second level hardware triggers are expected to reduce the trigger rate by at least a factor of 10 compared to the interaction rate. A third level software trigger searching for secondary vertices is expected to cut by another factor of 40.

1624 (FNAL/C–94/320-E) **The D0 Level 1.5 Calorimeter Trigger.** Drinkard, J. (California Univ., Irvine, CA (United States). Physics Dept.). D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–39: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002218. Source: OSTI; NTIS; INIS; GPO Dep.

We describe the design and preliminary performance of the D0 Level 1.5 Calorimeter Trigger.

1625 (FNAL/C–94/340-E) **Aging tests of ethylene contaminated argon/ethane.** Atac, M. (Fermi National Accelerator Lab., Batavia, IL (United States)); Bauer, G. Fermi National Accelerator Lab., Batavia, IL (United States). 22 Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. Order Number DE95002526. Source: OSTI; NTIS; INIS; GPO Dep.

We report on aging tests of argon/ethane gas with a minor (1800 ppM) component of ethylene. The measurements were first conducted with the addition of alcohol to test the suppression of aging by this additive, with exposure up to $\approx$1.5 C/cm. Tests have included: a proportional tube with ethanol, another with isopropyl alcohol, and for comparison a tube has also been run with ethanol and argon/ethane from CDF's old (ethylene-free) ethane supply. The aging test with ethanol showed no difference between the ethylene-free and the ethylene tube. Furthermore, raw aging rates of argon/ethane and argon/ethane/ethylene were measured by exposing tubes without the addition of alcohol to about 0.1 C/cm. Again, no significant difference was observed. In conclusion, we see no evidence that ethylene contamination up to 1800 ppM has any adverse effect on wire aging. However, this level of ethylene does seem to significantly suppress the gas gain.

1626 (FNAL/C–94/342-E) **Mechanical design of the D0 silicon detector.** Cooper, W.E. D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–45: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002532. Source: OSTI; NTIS; INIS; GPO Dep.

The upgrade of the DO detector for Run II of the Fermilab collider includes the addition of a silicon tracker for vertex determination. The mechanical structure of the silicon tracker is described.

1627 (FRCEA-TH–405) **Study and characterization of semi-conductor materials III-V for their applications to the ionizing radiation detection.** Moulin, H. CEA Centre d'Etudes de Grenoble, 38 (France). Lab. d'Electronique et d'Instrumentation; Grenoble-1 Univ., 38 (France). 8 Nov 1989. 299p. (In French). Order Number DE95606725. Source: OSTI; NTIS (US Sales Only); INIS.

This work is the study of photoconduction in volume of gallium arsenide and of indium phosphide doped with iron for their applications to X-ray detection which is carried out directly in the material. After having recalled the physical characterization of materials and the principle of photoconduction, we describe two informatic simulations. The first supposes the spatial uniformity of the electric field on the semiconductor, the second takes the spatial and temporal variations of the field into consideration. Then we show the advantage of a first irradiation to neutrons of the photoconductors. With the gallium arsenide there is swiftness improvement of the detectors to the detriment of the sensitivity. The second part studies first the characterizations in the obscurity of the photoconductors according to the electric polarization field and to the neutron dose they received before and then their characterizations under X radiation. 77 refs., 221 figs., 33 tabs., 6 photos., 3 annexes.

1628 (FZR–53) **A retarding field energy analyser to measure the energy distributions of liquid metal ion sources.** Stins, O.W.M. (Technische Hogeschool Twente, Enschede (Netherlands)). Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Aug 1994. 34p. Order Number DE95715035. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper the setup and use of a retarding field energy analyser to measure the energy distribution of LMIS will be presented. An introduction in the technology and mechanism of LMIS will be given in chapter 2. The experimental configuration of the retarding field energy analyser, together with an error estimation and a computer program, to control the energy analyser and to calculate the energy distribution, will be discussed in chapter 3. To test the energy analyser an electron source, consisting of a tungsten thermoionic cathode, will be used. Energy distribution measurements of a gallium LMIS will be presented in chapter 4. Finally in chapter 5, the accuracy of the energy analyser and suggestions for improvement will be presented. (orig.)

1629 (GSI–94-04) **Calorimetric low-temperature detectors on semiconductor base for the energy-resolving detection of**

heavy ions. Kienlin, A. von. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); Mainz Univ. (Germany). Fachbereich 18 - Physik. Jan 1994. 182p. (In German). Order Number DE95711703. Source: OSTI; NTIS (US Sales Only); INIS.

For the first time calorimetric low-temperature detectors for the energy-resolving detection of heavy ions were developed and successfully applied. Beside the development of the detector also the understanding of the basing physical processes and their limitations for the conversion of the kinetic particle energies into a (mean) temperature increase of the detector hold the spotlight. Constructed were two different detector types, which work with a semiconductor thermistor. By it the temperature increasement effected by a particle incidence is read out. In the first detector type the thermistor was simutaneously used as absorber. The thickness of the germanium crystals was sufficient in order to stop the studied heavy ions completely. In the second type, a composed calorimeter, a sapphire crystal, which was glued on a germanium thermistor, served as absorber for the incident heavy ions. The working point of the calorimeter lies in the temperature range (1.2-4.2 K), which is reachable with a pumped ^{4}He cryostat. The temperatur increasement of the calorimeter amounts after the incidence of a single α particle about 20-30 μK and that after a heavy ion incidence up to some mK. Both calorimeter types were first studied by characterization measurements (temperature calibration of the thermistor resistance), voltage-current characteristics, determination of the heat capacitance and determination of the heat conductivity to the coldness bath and subsequently tested by 5.5 MeV α particles. For these an absolute energy resolution of 400-500 keV was reached. In nine beam times the calorimeters were irradiated by heavy ions (^{20}Ne, ^{40}Ar, ^{136}Xe, ^{208}Pb, ^{209}Bi) of different energies (3.6 MeV/nucleon<E<12.5 MeV/nucleon) elastically scattered from gold foils. In the pulse height spectra of the first detector type relatively broad, complex-structurated line shapes were observed.

1630 (GSI–94-58(prepr.)) **Mass measurements of short-lived isotopes in traps and storage rings.** Kluge, H.J. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Bollen, G.; Franzke, B. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 16p. (CONF-940707–: 14. international conference on atomic physics, Boulder, CO (United States), 31 Jul - 5 aug 1994). Order Number DE95715044. Source: OSTI; NTIS (US Sales Only); INIS.

High-accuracy mass measurements can be performed on short-lived radionuclides with half-lives $T_{1/2} \geq 1$ ms by storing them in ion traps or storage rings. The masses of about 80 isotopes have been determined with a resolving power of typically one million and an accuracy of $\delta m/m=10^{-7}$ with the tandem Penning trap mass spectrometer ISOLTRAP installed at the on-line mass separator ISOLDE/CERN. Schottky and time-of-flight mass measurements will soon start at the storage ring ESR at GSI/Darmstadt on highly charged ions delivered at relativistic energies from the fragment separator. Further developments and projects are discussed. (orig.)

1631 (INIS-mf–14318) **Development of a personal digital dosimeter.** Sukjai, K. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology. 1993. 122p. (In Thai). Order Number DE95603949. Source: OSTI; NTIS (US Sales Only); INIS.

A compact size personal dosimeter was developed using electronic parts mainly available locally with the aim of having a low cost dosimeter capable of operating in local ambient conditions with ease of maintenance. Besides, the use of CMOS IC's reduces power consumption considerably. The dosimeter has a measuring range of 0-9999 mR using 7 segment LED display clearly readable even in the illuminated area. It is also equipped with alarm system to monitor presentable dose accumulation, dose rate at each 1 mR, saturation of GM detector at high level dose and the radiation surpassing levels selectable in steps of 2.5, 10 and 25 mR/hr. The dosimeter has a size of 7.4x12x3 cm^3 with a weight of 300 g and is powered with four 1.2 V AAA size rechargeable Ni-Cd batteries with an energy capacity of 180 Ah each. A miniature GM tube for gamma and X-ray measurement is used as radiation detector. The results of performance testing and calibration show that the dosimeter can measure a dose rate up to 2.5 R/hr with an error less than of +-20% in energy range of 100-1330 keV. Using Cs-137 standard calibration source, the accuracy and precision of the dosimeter at dose limit of 2.5 R/hr are +-14% and 3% respectively. The dosimeter can be continuously operated for 7 hours with fully charged batteries at 300 mW power consumption, while at the lowest operational battery voltage of 4.53 V the dosimeter shows an error less than +-15%.

1632 (INIS-mf–14340, pp. 189-194) **Digital area monitor.** Boonyawan, D. (Chiang Mai Univ., Faculty of Science, Department of Physics (Thailand)); Paradkhun, V.; Vilaithong, T.; Sornphorm, P. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

A digital area monitor measuring up to 2 R/hr was developed for use in high gamma radiation areas. A plastic scintillation detector of 1" 0 x 1" thickness was used instead of a NaI(Tl) detector, which is not suitable for n-sec signal pulses. A liquid crystal digital display (LCD) was chosen in preference to an analog one, as it is easier to read. A 12 v, 6.5 Ah battery was used to supply power for the detector and the converter circuit, which allows 6-8 hr continuous operating time. The monitor can measure gamma energies above 0.511 MeV and weighs 3 kg. The results show that the absolute error at the 0.511 and 0.661 MeV thresholds are 8% and 5% respectively, using Cs-137 and Co-60 standard sources.

1633 (INIS-mf–14340, pp. 424-431) **The production of thermoluminescence dosemeter, $CaSO_4$(Dy).** Sriratchatchaval, V. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

This research is to develop the crystallization thermoluminescence dosemeter (TLD) $CaSO_4$(Dy) technique and process. The dosemeter is widely used in radiation measurement due to its measurement ability between $1.0x10^{-3}$ mGy - 10^2 Gy. The technique and process of crystallization thermoluminescence dosemeter $CaSO_4$(Dy) by this method give good crystals, that are easily crystallized and have high purity. Not only the qualities of this crystal powder are the same as the imported type but the price is also lower about ten times.

1634 (INIS-mf–14340, pp. 466) **Development of a simple beam monitor at FNRF.** Godfrey, L. (Chaing Mai Univ., Faculty of Science, Department of Physics, Fast Neutron Research Facility (Thailand)); Hoyes, G.; Pairsuwan, W.; Vilaithong, T. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Published in abstract form only.

A two-dimensional intercepting multiwire ion beam profile monitor has been developed for use with the low-intensity deuteron beamline at the Fast Neutron Research Facility, Chiang Mai University. Several have been tested using a continuous ion beam current of up to 200 microamps and kinetic energy up to 140 keV. We have achieved our design objectives of low material and labour costs, good spatial resolution and measurement of relative beam current, elimination of the need for costly vacuum feed-through and the ability to rapidly insert the monitors, wherever needed along the beamline, with minimum disruption to neighbouring elements. Use of four of these monitors have greatly simplified the optimization of our beam transport system and enabled us to adjust our steering and focusing for maximum target current.

1635 (INIS-mf–14375) **Studies of the physical parameters for the determination of tritium in urine by the liquid scintillation.** Amrani, D. (Centre de Radioprotection des Rayonnements, Dept. de la Dosimetrie des rayonnements, Algiers (Algeria)). Secretariat d'Etat a la Recherche, Algiers (Algeria). Jun 1994. 13p. Order Number DE95603950. Source: OSTI; NTIS (US Sales Only); INIS.

The technique of determination of tritium body burdens in human urine by the liquid scintillation is well known as method in many countries. The quenching phenomenon of counting rate is important in the case of biological samples. The counting efficiency varies from one sample another. Many counting measurements have been carried out in order to obtain better counting efficiency of tritium, firstly by altering the volumes of the liquid scintillation cocktail (LUMAGEL) from 5 to 12 ml and keeping the quantity of decolorized urine constant at 1ml; secondary the adjustment and the setting up of the counting channels of the counter in tritium window. The quench correction curve was obtained from the counting geometry, which gave the best counting efficiency. Variable quantities of the quenching agent chloroform were added to the non quenching standard samples. the best estimation of the equation of the equation curve is: Y =8.E-5 X2 - 0.1 X + 29.3 The counting efficiency of tritium varies between 8.32% and approximatly 30% and for 10 ml of LUMAGEL with 1 ml of urine.

1636 (INIS-mf–14386, pp. WP43) **A double monochromator system for a medium resolution neutron powder diffractometer.** Burke, M.D. (University of Technology, Sydney, NSW (Australia)); Sabine, T.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. MONOCHROMATORS/germanium; NEUTRON DIFFRACTOMETERS/monochromators; MONOCHROMATIC RADIATION; MONOCHROMATORS; GERMANIUM; OPTIMIZATION; PERFORMANCE; REFLECTIVITY; RESOLUTION

1637 (INIS-mf–14386, pp. TP40) **An elastic recoil time of flight spectrometer for material analysis.** Martin, J.W. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Russell, G.J.; Cohen, D.D.; Dytlewski, N.; Garton, D.B. [1994]. 227p. Sponsored by Australian Inst. of Nuclear Science and Engineering, Lucas Heights, NSW (Australia). (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. HEAVY ION SPECTROMETERS/design; HEAVY ION SPECTROMETERS/time-of-flight method; ANSTO; ELASTIC SCATTERING; DESIGN; IODINE 127 BEAMS; MEV RANGE 10-100; SPECIFICATIONS; USES

1638 (INIS-mf–14386, pp. WP63) **A high temporal resolution solid state thermal neutron detector.** McKean, N.S. (Swinburne Coll. of Technology, Hawthorn, VIC (Australia)); Bartel, A.; Bakshi, E.N.; Davis, R.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 8 refs. SOLID SCINTILLATION DETECTORS/neutron diffraction; FOILS; GADOLINIUM; LAUE METHOD; RESOLUTION; STRUCTURAL CHEMICAL ANALYSIS; THERMAL NEUTRONS; TIME-OF-FLIGHT METHOD

1639 (INIS-mf–14393, pp. 98-99) **The applied L-glutamine in gamma and electron dosimetry.** Owczarczyk, H.B. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)). Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs. ELECTRON DOSIMETRY/glutamine; GAMMA DOSIMETRY/glutamine; GLUTAMINE; SPECTROPHOTOMETRY

1640 (INIS-mf–14393, pp. 103) **Computer operated 256 channel pulse analyser for scintillation and proportional detectors.** Antoniak, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Machaj, B. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 1 fig. COMPUTERIZED CONTROL SYSTEMS/gamma spectrometers; ON-LINE CONTROL SYSTEMS; PROPORTIONAL COUNTERS; PULSE TECHNIQUES; SCINTILLATION COUNTERS

1641 (JINR-R–10-94-149) **Communication VME-KK009 interface to control CAMAC equipment.** Rezaev, V.E.; Sirotin, A.P.; Tishin, A.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 7p. (In Russian). Order Number DE95603985. Source: OSTI; NTIS (US Sales Only); INIS.

Communication VME-KK009 interface and software which permit to provide a joint operation of VME standard equipment with CAMAC standard equipment are described. Wide spread in JINR KK009 type interface is used as CAMAC Data way controller. The means offered allow processor units situated on VME bus and CAMAC modules to operate jointly both via the program transfer channel and interrupt structure. Communication VME-KK009 interface is a dual height Eurocard, it uses one position in VME rack and P 1 connector. 4 refs.; 1 fig. (author).

1642 (JINR-R–13-94-114) **The track system of the modernized 'Hyperon' spectrometer.** Volod'ko, A.G. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Davydov, Yu.I.; Dzhincharadze, D.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 11p. (In Russian). Order Number DE95604003. Source: OSTI; NTIS (US Sales Only); INIS.

The description of the multiwire proportional chambers of the 'Hyperon' facility aimed at research of the rare kaon decays is presented. The setup includes 39 multiwire chambers with areas from 128-128 mm^2 up to 90-130 cm^2 which contain about 9500 channels. Two magnetic spectrometers based on these multiwire chambers provide the momentum resolution 0.5% and 1.1% consequently at momentum 10 GeV/c. 11 refs.; 7 figs.; 2 tabs. (author).

1643 (Juel–2852) **A large-area scintillation detector with matrix readout for experiments at COSY.** Wolke, M. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik. Dec 1993. 81p. (In German). Order Number DE95711694. Source: OSTI; NTIS (US Sales Only); INIS.

For the requirement of a time-of-flight measurement in the framework of the experiment E5 at the proton synchrotron COSY Juelich by means of a Monte-Carlo simulation the geometrical parameters of a large-area scintillator plane with matrix-arrangement of the read-out photomultipliers could be optimized. A system for the monitoring of the tube amplifications, basing on short light pulses emitted by luminescence diodes, was modificatedly transeferred to this application and successfully tested. For the time resolution of the detector values could be determined, which lie in the mean by about 30 % above the theoretical expectations. For minimally ionizing particles an accuracy of the time-of-flight information from the combination of start and stop scintillator of the experiment E5 in a range $\sigma_{tof} \approx 240\text{-}260$ ps dependent on the incident position of the particle to be analyzed, was measured. On the base of this measurement for protons of a momentum of 1 GeV/c at application of the detector in its second construction stage an upper limit of the time-of-flight resolution of correspondingly $\sigma_{tof} \approx 195\text{-}220$ ps is to be expected. From this a crude upper estimation of the momentum resolution of $\sigma_p/p \approx 1.0\text{-}1.2$ % results. A position reconstruction by means of the c. m. method showed qualitatively an expected behaviour of the systematic deviations between reconstructed and real incidence positions. Quantitativeley a mean fluctuation of the reconstructed positions of 1.3 respectively 0.8 cm for the horizontal respectively vertical direction is reached.

1644 (Juel–2892) **Studies on a modular high-energy photon spectrometer of pure CsI scintillators.** Kopyto, D. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik; Koeln Univ. (Germany). Apr 1994. 73p. (In German). Order Number DE95711497. Source: OSTI; NTIS (US Sales Only); INIS.

Aim of the present thesis is the optimization of components for the construction of a high-energy photon spectrometer of pure CsI for the detection of the neutral pseudoscalar mesons π^0, η, and η' at COSY. These mesons are distinguished by their decay into two γ quanta and can therefore be detected by means of a photon

spectrometer. Fast scintillators with dominating time constants below 100 ns are required. Pure CsI possesses time constants of 10 and 30 ns with a contribution >80 %. Therefore a concept of a 2-arm shower counter of pure CsI is presented. Conclusions on the energy resolution of such a calorimeter yield a test module, which is constructed of 5.5 CsI(pure) pyramide trunk, each of which possesses a length of 30 cm and an angular acceptance of 6 .6 . The geometry of the moduls is formed in such a way that its extension to a 2-arm shower counter is possible at any time. Hitherto 14 by teflon foils wrapped up crystals for the test module were tested. Their energy resolution varies at 0.66 MeV between 20 and 25 % FWHM. The ratio of their fast components (measured in the time window of 100 ns) to the whole light (time window: 3 μs) lied between 72 and 81 %. The property important for a shower counter is a low position dependence of the light detection efficiency of the crysal elements: 7 of the delivered pyramide trunks exhibit values <3 % and correspond so to our requirements. For the position dependence of a crystal even a value of 1.1 % could be reached. The energy resolution amounted thereby to 22 % FWHM. A measurement of the energy resolution with 20 MeV protons yielded a value of 7 %. Under the assumption of pure photon statistics as cause for the line widths starting from the 0.66 MeV γ line (energy resolution: 20 % FWHM) for the relative line width of the 20 MeV protons a value of 5 % was estimated.

1645 (Juel–2901) **Development of an induction drift chamber for experiments at COSY and high-rate effects according to a new method.** Stratmann, R. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik; Bonn Univ. (Germany). Apr 1994. 118p. (In German). Order Number DE95707754. Source: OSTI; NTIS (US Sales Only); INIS.

One of the first experiments with the new proton storage ring COSY will be the measurement of the differential cross-section in the reaction pd$\rightarrow{}^3$Heη at threshold. Monte-Carlo-Calculations have proved that the Time-Of-Flight-detector (TOF) is well suited for such measurements with a good resolution and almost 4π-acceptance (in CMS). The necessary supression of background reactions will be achieved by using the time-of-flight- and the ΔE-information of the scintillator hodoscopes of this apparatus. In the future, the TOF-detector will be extended by an additional tracking device with good spatial resolution ($\sigma_x \approx 30$ μm) and high rate capability ($\propto 10^6$ p/mm^2.s) to improve the angular resolution and to identify secondary vertices. Such a device, an Induction Drift Chamber, was developed and has been tested in measurements in Hamburg, Bonn and at CERN (Geneva). To assure long-term stability of this drift chamber, a detailed study on the mechanisms of wire-breaking due to sparks was carried out. Based on the results of this examination, a new technique for an almost massless support of the wires with nylon threads was developed, which helped to avoid breakdowns of the chamber due to destroyed wires. In the first measurement with COSY the IDC was installed to test its applicability as a high resolution beam monitor and to measure the rate capability with highly ionizing protons. The IDC shows a good performance and is able to determine the COSY beam diameter with a resolution of less than 100 μm. The use of a Flash-ADC read out of the chamer signals made it possible to test a new method for an exact measuring of the rate dependency of the gas gain, even at a low beam rate. At a gas gain of $\approx 2.10^3$ the IDC can be used up to beam rates of at least $2.5.10^6$ particles/mm^2.s.

1646 (Juel–2922) **Strangeness production in the pp and pp scattering.** Rook, M. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik; Bonn Univ. (Germany). Jun 1994. 107p. (In German). Order Number DE95711199. Source: OSTI; NTIS (US Sales Only); INIS.

Monte-Carlo calculations for the in the construction phase being experiment COSY11 confirm the performability of the measurement of the reaction type pp$\rightarrow$ppX for a meson X in the 1 GeV/c^2 mass range in the neighbourhood of the reaction threshold. From the requirement of minimal acceptance confinement for this reaction type follows the dimensionation of the detector components. The expected counting and trigger rates for the fixed detector arrangement represents no limits for the lifetime of the detector components as well as the capacity of the data-acquisition system. For the near-threshold measurement range for the ppX reaction an acceptance of above 90 % results. Beyond the measurement of the main reaction anti pp$\rightarrow\Phi\Phi\rightarrow K^+K^-K^+K^-$ at the PS202 experiment at LEAR, which is motivated by the search for glueballs, a measurement of reactions into an antihyperon-hyperon pair at high beam momenta of up to 2.0 GeV/c seems to be possible. The determination of total cross sections for the anti $\Lambda\Lambda$ and anti $\Sigma^0\Lambda$+c.c reaction at 1.9 GeV/c with values of 88$\pm$2 μbarn and 46$\pm$2 μbarn (statistical error) is compatible with the already present results of the PS185 experiment. Because of efficiency the analysis of the anti $\Sigma^0\Sigma^0$ channel is confined to the highest beam momentum of 2.0 GeV/c. The lack of anti $\Sigma^0\Sigma^0$ at the end of the analysis chain finds its cause in the too low integrated luminosity of the treated data set. An analysis of a recently avaible becomed data set at equal beam momentum, for which a higher integrateds luminosity is expected, is still pending.

1647 (LAPP-EXP–94-04) **THe proximity focused hybrid photodiode detector.** Basa, S. (Centre National de la Recherche Scientifique (CNRS), 13 - Marseille (France)); Clemens, J.C.; Commercon, M.; Sauvage, D.; Tisserant, S.; Gaillard, J.M. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Mar 1994. 5p. (CONF-9310381–: SCIFI 93: Workshop on scintillating fibre detectors, Notre Dame, IN (United States), 24-28 Oct 1993). Order Number DE95606708. Source: OSTI; NTIS (US Sales Only); INIS.

A new type of light detector, the Proximity Focused Hybrid Photodiode Detector, has been constructed and its properties have been studied. The main features of the new device are: a gain of up to a few thousand varying linearly with the applied high voltage, a large dynamic range, a low sensitivity to magnetic field, a power consumption close to zero and a multipixel capability. (authors) 1 ref., 5 figs.

1648 (LAPP-EXP–94-05) **Fibre tracking: An overview.** Gaillard, J.M. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Mar 1994. 17p. (CONF-9310381–: SCIFI 93: Workshop on scintillating fibre detectors, Notre Dame, IN (United States), 24-28 Oct 1993). Order Number DE95606709. Source: OSTI; NTIS (US Sales Only); INIS.

A large-size scintillating plastic fibre tracking detector was built as part of the upgrade of the UA2 central detector at the SPS proton-antiproton collider. The cylindrical fibre detector of average radius of 40 cm consisted of 60000 plastic fibres with an active length of 2.1 m. One of the main motivations was to improve the electron identification. The fibre ends were bunched to be coupled to read-out systems of image intensifier plus CCD, 32 in total. The quality and the reliability of the UA2 fibre detector performance exceeded expectations throughout its years of operation. A few examples of the use of image intensifiers and of scintillating fibres in biological instrumentation are described. (R.P.) 11 refs., 15 figs., 2 tabs.

1649 (LA-UR–94-3167) **Summary of evaporative cooling system for the SSC silicon tracker.** Woloshun, K.; Barber, R.L.; Christensen, W.; Hanlon, J.A.; Keddy, M.D.; Miller, W.O.; Reid, R.S.; Ziock, H.J. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410225–1: WELDEC: workshop on electronics and detectors cooling, Lausanne (Switzerland), 4-7 Oct 1994). Order Number DE95000921. Source: OSTI; NTIS; GPO Dep.

An evaporative cooling system has been developed for the Superconducting Supercollider (SSC) Solenoidal Detector Collaboration (SDC) and the Gamma, Electron and Muon Detector (GEM) silicon tracker electronics. The system operated on the principles of the heat pipe; specifically, evaporation at near vapor-liquid equilibrium without the presence of noncondensible gases, and with a capillary media used to distribute the working fluid. The system used butane as a working fluid for operation at O°C and 1 atm. pressure. This paper summarizes the evolution of the system design, emphasizing key developments that may be useful for further work. Results of the system performance as of the close-of-effort are presented. A brief summary of results of experiments using a pumped single-phase cooling system are also presented.

1650 (LA-UR–94-3244) **Supertrack Monte Carlo variance reduction experience for non-Boltzmann tallies.** Estes, G.P.; Booth, T.E. Los Alamos National Lab., NM (United States). [1994].

11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9404215–1: Mathematics and computations, reactor physics, and environmental analysis, Portland, OR (United States), 30 Apr - 4 may 1994). Order Number DE95000939. Source: OSTI; NTIS; INIS; GPO Dep.

This paper applies a recently developed variance reduction technique to the first-principles calculations of photon detector responses. This technique makes possible the direct comparison of pulse height calculations with measurements without the need for unfolding techniques. Comparisons are made between several experiments and the calculations to demonstrate the utility of the supertrack Monte Carlo technique for reproducing and interpreting experimental count rate spectra.

1651 (LA-UR–94-3344) **A cryogenic dose calorimeter for pulsed radiographic accelerators.** Watson, S.A.; Kauppila, T.; Mueller, K.H. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410219–1: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95001017. Source: OSTI; NTIS; INIS; GPO Dep.

Calorimetry is the most direct, absolute technique for absorbed dose measurements. To improve the measurement accuracy for use with quantitative radiography, a calorimeter has been developed for LANL's pulsed radiographic machines which produce Bremsstrahlung radiation fields of 50-200 Rad per pulse at 1 meter from the source. This paper describes the theory of operation, the calorimeter design, and presents results from the PHERMEX accelerator.

1652 (LIU-TEK-LIC–1994-18) **A new method to extract gas concentrations in the ultraviolet and visible wavelength ranges, based on differential optical absorption technique and Fourier transform.** Linkoeping Studies in Science and Technology, 432. Axelsson, L. Linkoeping Univ. (Sweden). Dept. of Physics and Measurement Technology. Apr 1994. 17p. Order Number DE95606688. Source: OSTI; NTIS; INIS.

By combining differential optical absorption technique with Fourier transformation we obtain a measuring method exhibiting high sensitivity, good accuracy and good robustness against wavelength displacements in the spectrum obtained. The method also separates different gases in the absorption spectrum from each other in an effective way. The above mentioned features make this method attractive. The ability to separate gases is especially rewarding; it means that we need not know which gases are present when we start to measure. The only prerequisite is that the gases involved absorb in the wavelength range that is to be measured. The method appears to be well suited for the detection of atmospheric pollutions.

1653 (LYCEN–9424) **A micro-strip gas counter test with the RD20 front-end.** Clergeau, J.F.; Contardo, D.; Haroutunian, R.; Smadja, G. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. May 1994. 16p. Order Number DE95606710. Source: OSTI; NTIS (US Sales Only); INIS.

A Micro-Strip Gas Counter equipped with the VLSI preamplifier of the RD20 chip has been tested with minimum ionizing particles. The measured pulse shape and the signal to noise ratio are presented. The time resolution of the detector is compared for the Ar/DME and DME/CO_2 gas mixtures. Three methods for the bunch crossing identification at LHC are discussed. (authors). 5 refs., 7 figs., 3 tabs.

1654 (MPI-PhE–94-21) **Development of the optical components of an alignment system for the muon spectrometer of the ATLAS detector.** Widmann, P. Muenchen Univ. (Germany). Sektion Physik. Sep 1994. 138p. (In German). Order Number DE95715015. Source: OSTI; NTIS (US Sales Only); INIS.

In the framework of the development of an electro-optical alignment system for the muon spectrometer of the ATLAS detector different types of optical sensors as well as components of a glass fiber network for the light distribution were studied for their suitability for a possible application. For the sensors a resolution of 10-20 μm in one and about 100 μm in the other coordinate is required. Especially for the application in the ATLAS detector developed silicon strip detectors permit in their current state of development a position resolution of 5-7 μm in the strip coordinate and 30 μm in the ohter coordinate (with current division on the strip). In the combination of several sensors in a beam the beam deviation by light refraction has been proved as additional error source. as much promising alternative strip sensors of amorphous silicon have been proved. These sensors allow in both directions an equally high position resolution. With a not transparent prototype resolutions of 1.8 μm in one and 2.3 μm in the second coordinate were reached without corrections. Additionally it is possible to fabricate these sensors in transparent form on glass substrates with optical quality, which may permit a complet abandonment on corrections of the beam deviation. The transmission of these sensors amounts at a wavelength of 690 nm currently to about 60%. By optimization of the layer thicknesses however transmission rates of up to 80% should be reachable. The studied components for the light distribution via glass fibers corresponded to their specifications. The application of one-mode fibers guarantees thereby the Gaussian profile of the laser beams collimated with objectives desirable for the position measurement with strip detectors.

1655 (OUP–94-15) **Precision determination of the Z° resonance parameters.** Read, A.L. Oslo Univ. (Norway). Fysisk Inst. Aug 1994. 9p. Order Number DE95606711. Source: OSTI; NTIS; INIS.

During 1993, LEP was run at three energies near the Z° peak in order to give improved measurements of the mass and width of the resonance. DELPHI accumulated data corresponding to an integrated luminosity of 30.4 pb^{-1} during the dedicated scan with frequent measurements of the LEP energy, and 5.7 pb^{-1} at the Z° peak before the start of the scan. Analyses have been carried out on the hadronic and leptonic cross sections, and the leptonic forward-backward asymmetries, using the most accurate evaluations of the LEP energies. Fits to this data and previously published DELPHI lineshape and asymmetry data have been performed. Values of the Z° resonance parameters with significantly smaller errors than those previously published are obtained. 7 refs., 4 figs.

1656 (SLAC-PUB–6686) **Performance of the SLD CCD pixel vertex detector and design of an upgrade.** Strauss, M.G. (Massachusetts Univ., Amherst, MA (United States)). SLD Collaboration. Stanford Linear Accelerator Center, Menlo Park, CA (United States); Massachusetts Univ., Amherst, MA (United States). Oct 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515 ; FG02-92ER40715. (CONF-940722–27: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95001850. Source: OSTI; NTIS; INIS; GPO Dep.

We present the performance of the SLD CCD pixel vertex detector (VXD2) after two years of running experience in the SLC e^+e^- beam environment and the design of a significantly improved upgrade (VXD3) to be installed in late 1995. The existing VXD2 has performed very reliably. A spatial resolution of ~5 μm in both the Rϕ and Z coordinates has been achieved. Impact parameter resolutions of 11 μm in the Rϕ view and 38 μm in the RZ view for high momentum tracks are observed from the data. The upgraded design has full three layer solid angle coverage to $|\cos\theta| = 0.85$, using CCDs at a much larger size of 8.0 x 1.6 cm. Optimized geometry and reduced material will improve the impact parameter resolution by a factor of two compared with VXD2. This upgrade will greatly enhance the heavy flavor physics potential of SLD, allowing a unique exploration of the B_s mixing time evolution measurement in an interesting x_s region.

1657 (WHC-SD-SQA-CSWD–30016) **Verification and validation of DEPOSITION 2.0.** Eadie, W.J. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001599. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to verify and validate the usage of the computer program, DEPOSITION 2.0 for use in assessing line loss in CAM and fixed head lines throughout certain Hanford Site facilities. The scope of use is limited to this function. DEPOSITION 2.0 is the second version of this code to be used on the Hanford Site, the program now incorporates additional user-friendly

features beyond those which were available in an earlier version, DEPOSITION 1.03.

1658 (WHC-SD-W007H-ATP-002) **BCE selector valves and flow proportional sampler.** Rippy, G.L. Rochester Univ., NY (United States). Dept. of Radiation Therapy. 30 Sep 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002086. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Electrical/Instrumentation systems for the BCE function as required by project criteria.

4402 Radiation Effects On Instrument Components, Instruments, Or Electronic Systems

Refer also to citation(s) 1616

1659 (FRNC-TH–3740) **Study of integrated circuits in natural space environment.** Karoui, S. Institut National Polytechnique, 38 - Grenoble (France). Nov 1993. 316p. (In French). Order Number DE95606757. Source: OSTI; NTIS (US Sales Only); INIS.

In this thesis we study one of the critical phenomena induced by the radiation of integrated circuits in the natural space environment: the so-called upset phenomenon. This phenomenon, caused by a heavy-ion strike on circuit sensitive areas, result in the modification of the information stored in a memory element. Upsets may then perturb the functioning of satellite-borne complex processors with serious consequences on the control of equipments operating in space. As commonly used processes or design hardening techniques cannot guarantee a total immunity against upsets, provisional methods are generally adopted to select the less sensitive circuits among components to be used in a space application. These methods consist in the simulation of the irradiated environment by means of particle accelerators, to get experimental figures about the upset sensitivity of the considered circuit. To implement such experiments on different processor types, we have designed and developed a dedicated test system, the FUTE 16 tester. This tester has been used in several test experiments where irradiated environment was simulated by means of particle accelerators. The activity of the target circuit during the irradiation could have a great influence on the measured upset sensitivity. Generally used test sequences so-called "register test", consist on the initialization of accessible registers with known data, and the observation of their content after a given delay to detect errors due to upsets. The main goal of this thesis is to compare in orbit error rate estimations obtained with register tests, to those obtained with "application like" test sequences. Both kinds of test sequences have been used during heavy-ion test experiments performed on commercially available CISC and RISC processors. The results obtained clearly show that using "register tests" may lead to wrong decisions in the selections of parts intended for space applications.

1660 (HMI-B–509) **Hydrogen incorporation and radiation induced dynamics in metal-oxide-silicon structures: A study using nuclear reaction analysis.** Briere, M.A. Technische Univ. Berlin (Germany). Fachbereich 4 - Physik; Hahn-Meitner-Institut Berlin GmbH (Germany). Bereich Datenverarbeitung und Elektronik. Jul 1993. 101p. Order Number DE95708631. Source: OSTI; NTIS (US Sales Only); INIS.

Resonant nuclear reaction analysis, using $^{1}H(^{15}N, \alpha\gamma)^{12}C$ reaction at 6.4 MeV, was used to study hydrogen incorporation and radiation induced migration in metal-oxide-silicon structures. Effect of processing parameters on H content of thermal oxides, with and without gate material present, was studied. It is found that the dominant source of hydrogen in Al gate devices and dry oxides is often contamination, likely in the form of adsorbed water vapor, formed upon exposure to room air after removal from the oxidation furnace. H concentrations in the bulk oxide as high as 3 10^{20} cm^{-3} (Al gate), and as low as 1 10^{18} cm^{-3} (poly Si-gate) were observed. Hydrogen accumulation at the Si-SiO_2 interface has been reproducibly demonstrated for as-oxidized samples, as well as for oxides exposed to H_2 containing atmospheres during subsequent thermal processing. The migration of hydrogen, from the bulk oxide to the silicon-oxide interface during NRA, has been observed and intensively investigated. It is found, that the cross section for this migration, per incident ^{15}N ion, depends on the sample processing history and ranges from 1 to 3 10^{-17} cm^2. It is argued that the release is due to electron capture at Si-OH sites and that the migration is driven by reductions in the interfacial free energy associated with the incorporation of hydrogen within the strained oxide region. Preliminary evidence for a similar migration of hydrogen during irradiation with 2.5 MeV electrons is presented, which suggests that the migration occurs preferentially under applied fields which are directed to the silicon interface. It is argued that this bias effect is not due to the charge of the diffusing hydrogen species, rather to the action of another intermediary, probably holes, which modify the interfacial region so as to increase hydrogen solubility there.

1661 (INIS-mf–14386, pp. TP25) **Fibre optic chemical sensors.** Tapanes, E. (Monash Univ., Clayton, VIC (Australia)); Goode, J.; Rossiter, P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. OPTICAL FIBERS/chemical decladding; OPTICAL FIBERS/wave propagation; ABSORPTION SPECTROSCOPY; CLADDING; FABRICATION; INFRARED RADIATION; MONITORS; PHYSICAL RADIATION EFFECTS; WAVELENGTHS

1662 (INIS-mf–14393, pp. 76-77) **Comparison of the resistance of integrated circuits to various types of nuclear radiation.** Wronski, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Didyk, A.Yu.; Nazarov, V.N. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 1 fig., 1 tab. INTEGRATED CIRCUITS/irradiation; IRRADIATION; ION BEAMS; NEUTRON BEAMS; POSITRON BEAMS; RADIOSENSITIVITY

4406 Optical Instrumentation

Refer also to citation(s) 413, 741, 1503, 1765

1663 (BNL–60892) **Signal to noise improvements with a new Far-IR rapid-scan Michelson Interferometer.** Hirschmugl, C.J.; Williams, G.P. Brookhaven National Lab., Upton, NY (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940714–36: International meeting on synchrotron radiation instrumentation, Stony Brook, NY (United States), 18-22 Jul 1994). Order Number DE95002416. Source: OSTI; NTIS; GPO Dep.

In this paper we discuss signal to noise issues in the infrared spectral region, presenting an update on instrumentation developments that have focused on this topic. We have been able to achieve reproducibilities in the 0.01 % range for spectra measured in around 1 minute on samples with an area of 1 mm^2 illuminated with an fl 10 beam. We show how this result is consistent with the synchrotron source intensity and detector noise and we also show a comparison with a conventional globar source. For these new studies, a Nicolet™ Impact 400 rapid scan Michelson Interferometer was modified by Pike Technologies and installed in vacuum at the U41R infrared beamline at the NSLS. The instrument is capable of scanning at an optical retardation rate of 3.2 cm/sec, and of a data collection frequency of 50 kHz triggered by the co-linear reference beam of a HeNe laser. A proprietary Nicolet™ solid-state beamsplitter was used to cover the range from 10–2500 cm^{-1}. Spectra were taken in reflection at grazing incidence off a single crystal Cu surface in ultra-high vacuum using liquid helium cooled detectors of the photoconductive type (Cu/Ge) or bolometric type (B/Si). The sample throughput for this system was 0.01 mm^2 steradians.

1664 (ETDE/DE-mf–95711759) **Measuring technique of volatile hydrocarbons: Subproject: process spectrometry based on dynamical derivative technique. Status report.** Kist, R.; Klocke, U.; Knothe, M.; Riedel, W.J.; Schmidtke, G.; Wolf, H. Fraunhofer-Institut fuer Physikalische Messtechnik (IPM), Freiburg im Breisgau (Germany). Dec 1992. 70p. (In German). Sponsored

by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 01VQ9016. Order Number DE95711759. Source: OSTI; NTIS (US Sales Only).

The Dynamical Derivative Spectrometer (DDS) is measuring the direct extinction as well as the first and second derivatives. The gaseous probe is heated to avoid condensation. With the DDS extinctions down to $5*10^{-5}$ are determined at 5.4 cm absorption path length corresponding to +/- 0.3 ppm Benzene. Based on this development a compact cost-effective multicomponent spectrometer can be fabricated. - For a pathlength of 50 m (multireflection cell) concentration of pollutants in the ppb range can be measured. - The DDS has been exhibited on the INTERKAMA in Duesseldorf in October, 1992. (orig.). 31 figs.

1665 (LA–12865) **Visible fluorescence of weathered lead.** Martin, A.D.; Lyman, J.L. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002454. Source: OSTI; NTIS; GPO Dep.

This experiment explored the possibility of remotely detecting lead fragments by means of an ultraviolet laser or a handheld spectrometer. Lead oxide has a unique fluorescence spectrum (resolution 18 nm), but it does not phosphoresce.

1666 (SAND–94-0024) **Lidar technologies for airborne and space-based applications.** Henson, T.D. (Sandia National Labs., Albuquerque, NM (United States)); Schmitt, R.L.; Sobering, T.J.; Raymond, T.D.; Stephenson, D.A. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002954. Source: OSTI; NTIS; INIS; GPO Dep.

This study identifies technologies required to extend the capabilities of airborne light detection and ranging (lidar) systems and establish the feasibility of autonomous space-based lidars. Work focused on technologies that enable the development of a lightweight, low power, rugged and autonomous Differential Absorption Lidar (DIAL) instruments. Applications for airborne or space-based DIAL include the measurement of water vapor profiles in support of climate research and processing-plant emissions signatures for environmental and nonproliferation monitoring. A computer-based lidar performance model was developed to allow trade studies to be performed on various technologies and system configurations. It combines input from the physics (absorption line strengths and locations) of the problem, the system requirements (weight, power, volume, accuracy), and the critical technologies available (detectors, lasers, filters) to produce the best conceptual design. Conceptual designs for an airborne and space-based water vapor DIAL, and a detailed design of a ground-based water vapor DIAL demonstration system were completed. Future work planned includes the final testing, integration, and operation of the demonstration system to prove the capability of the critical enabling technologies identified.

1667 (SAND–94-1375C) **Synthetic aperture radar processing with polar formatted subapertures.** Doerry, A.W. Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410156–2: 28. annual Asilomar conference on signals, systems, and computers, Pacific Grove, CA (United States), 31 Oct - 2 nov 1994). Order Number DE95001830. Source: OSTI; NTIS; GPO Dep.

Synthetic Aperture Radar (SAR) uses the motion of a small real antenna to synthesize a larger aperture, and thereby achieve very fine azimuth resolution. Efficient SAR image formation requires modelling the radar echo and compensating (focusing) the delay and phase for various positions in the target scene. Polar-Format processing is one successful algorithm developed to process large scenes at fine resolutions, but is still limited, especially at resolutions near a wavelength. This paper shows how using tiers of subapertures can overcome the limitations of Polar-Format processing and increase the focused scene size substantially while using only efficient vector multiplies and Fast Fourier Transforms.

1668 (SAND–94-2156C) **Unlimited-bandwidth distributed optical phase modulators and detectors: Design and fabrication issues.** Vawter, G.A.; Hietala, V.M.; Kravitz, S.H.; Armendariz, M.G. Sandia National Labs., Albuquerque, NM (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9411123–1: Institute of Electrical and Electronics Engineers (IEEE) Microwave Theory & Technology Society and Laser Electro-Optical Society conference, Ile-de-France (France), 21-23 Nov 1994). Order Number DE94017418. Source: OSTI; NTIS; GPO Dep.

Practical and theoretical limits on the bandwidth of distributed optical phase modulators and traveling-wave photodetectors are given. For the case of perfect velocity matching, RF transmission losses are the main performance-limiting factor. However, some high-performance modulators require highly-capacitive transmission lines making proper slow-wave operation difficult to achieve.

1669 (SAND–94-2572) **High frequency current sensors using the Faraday effect in optical fibers.** Cernosek, R.W. (Sandia National Labs., Albuquerque, NM (United States). Microsensor Research and Development Dept.). Sandia National Labs., Albuquerque, NM (United States). Sep 1994. 239p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001859. Source: OSTI; NTIS; GPO Dep.

This study investigates the high frequency response of Faraday effect optical fiber current sensors that are bandwidth-limited by the transit time of the light in the fiber. Mathematical models were developed for several configurations of planar (collocated turns) and travelling wave (helical turns) singlemode fiber sensor coils, and experimental measurements verified the model predictions. High frequency operation above 500 MHz, with good sensitivity, was demonstrated for several current sensors; this frequency region was not previously considered accessible by fiber devices. Planar fiber coils in three configurations were investigated: circular cross section with the conductor centered coaxially; circular cross section with the conductor noncentered; and noncircular cross section with arbitrary location of the conductor. The helical travelling wave fiber coils were immersed in the dielectric of a coaxial transmission line to improve velocity phase matching between the field and light. Three liquids (propanol, methanol, and water) and air were used as transmission line dielectric. Complete models, which must account for liquid dispersion and waveguide dispersion from the multilayer dielectric in the transmission line, were developed to describe the Faraday response of the travelling wave sensors. Other travelling wave current sensors with potentially greater Faraday sensitivity, wider bandwidth and smaller size are investigated using the theoretical models developed for the singlemode fibers coils.

4407 Geophysical and Meteorological Instrumentation

Refer also to citation(s) 1685, 1746, 1761

4408 Miscellaneous Instrumentation

Refer also to citation(s) 1175, 1367, 1462, 1474, 1489, 1839

1670 (DOE/ER/45157–T7) **A study of mechanical processing damage in brittle materials: Progress report.** Khuri-Yakub, B.T. Stanford Univ., CA (United States). Edward L. Ginzton Lab. [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-84ER45157. Order Number DE95002126. Source: OSTI; NTIS; GPO Dep.

During the last year, the authors have continued work on the ultrasonic characterization of machining-induced cracks and residual stresses in brittle materials. Techniques for the analysis of cracks and surface residual stress are being developed simultaneously. Finally, an acoustic microscope is being developed for the study of porosity and velocity variations in green ceramics.

1671 (DOE/PC/90181–T12) **Quarterly progress report, April 1, 1994–June 30, 1994.** Rosato, A.D.; Dave, R.N.; Fischer, I.S. New Jersey Inst. of Tech., Newark, NJ (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC22-91PC90181. Order Number DE95001955. Source: OSTI; NTIS; GPO Dep.

As discussed previously, the use of a single transmitter sphere yields limited accuracy. Consequently, a three transmitter module has been designed, tested and incorporated into a 1 inch diameter high density polyethylene sphere. Each transmitter broadcasts at a different frequency. The us of multiple transmitters required several involved modifications to the software which had been completed.

1672 **Spectrophotometric probe.** Prather, W.S.; O'Rourke, P.E. 1992. Filed date 29 Sep 1992. U.S. Patent Application 7-953,042. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95001773. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report discusses a support structure bearing at least one probe for making spectrophotometric measurements of a fluid using a source of light and a spectrophotometer. The probe includes a housing with two optical fibers and a planoconvex lens. A sleeve bearing a mirror surrounds the housing. The lens is separated from the mirror by a fixed distance, defining an interior space for receiving a volume of the fluid sample. A plurality of throughholes extending through the sleeve communicate between the sample volume and the exterior of the probe, all but one hole bearing a screen. A protective jacket surrounds the probe. A hollow conduit bearing a tube is formed in the wall of the probe for venting any air in the interior space when fluid enters. The probe is held at an acute angle so the optic fibers carrying the light to and from the probe are not bent severely on emergence from the probe.

1673 (SAND–94-1071C) **Reciprocal space mapping of epitaxial materials using position-sensitive x-ray detection.** Lee, S.R.; Doyle, B.L.; Drummond, T.J.; Medernach, J.W.; Schneider, R.P. Jr. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408178–1: 43. annual Denver x-ray conference, Steamboat Spring, CO (United States), 1-5 Aug 1994). Order Number DE95001620. Source: OSTI; NTIS; GPO Dep.

Reciprocal space mapping can be efficiently carried out using a position-sensitive x-ray detector (PSD) coupled to a traditional double-axis diffractometer. The PSD offers parallel measurement of the total scattering angle of all diffracted x-rays during a single rocking-curve scan. As a result, a two-dimensional reciprocal space map can be made in a very short time similar to that of a one-dimensional rocking-curve scan. Fast, efficient reciprocal space mapping offers numerous routine advantages to the x-ray diffraction analyst. Some of these advantages are the explicit differentiation of lattice strain from crystal orientation effects in strain-relaxed heteroepitaxial layers; the nondestructive characterization of the size, shape and orientation of nanocrystalline domains in ordered-alloy epilayers; and the ability to measure the average size and shape of voids in porous epilayers. Here, the PSD-based diffractometer is described, and specific examples clearly illustrating the advantages of complete reciprocal space analysis are presented.

1674 (SAND–94-2472C) **Development of a tester for evaluation of prototype thermal cells and batteries.** Guidotti, R.A. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950121–1: 10. annual battery conference on applications and advances, Long Beach, CA (United States), 10-13 Jan 1995). Order Number DE95000540. Source: OSTI; NTIS; GPO Dep.

A tester was developed to evaluate prototype thermal cells and batteries–especially high-voltage units–under a wide range of constant-current and constant-resistance discharge conditions. Programming of the steady-state and pulsing conditions was by software control or by hardware control via an external pulse generator. The tester was assembled from primarily Hewlett-Packard (H-P) instrumentation and was operated under H-P's Rocky Mountain Basic (RMB). Constant-current electronic loads rated up to 4 kW (400 V at up to 100 A) were successfully used with the setup. For testing under constant-resistance conditions, power metal-oxide field-effect transistors (MOSFETs) controlled by a programmable pulse generator were used to switch between steady-state and pulse loads. The pulses were digitized at up to a 50 kHz rate (20 μ s/pt) using high-speed DVMs; steady-state voltages were monitored with standard DVMs. This paper describes several of the test configurations used and discusses the limitations of each. Representative data are presented for a number of the test conditions.

1675 (UCRL-JC–116176-Rev.1) **Model-based ocean acoustic passive localization: Revision 1.** Candy, J.V. (Lawrence Livermore National Lab., CA (United States)); Sullivan, E.J. Lawrence Livermore National Lab., CA (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9409102–1-Rev.1: OCEANS '94, Brest (France), 13-16 Sep 1994). Order Number DE95001967. Source: OSTI; NTIS; GPO Dep.

A model-based approach is developed (theoretically) to solve the passive localization problem. Here the authors investigate the design of a model-based identifier for a shallow water ocean acoustic problem characterized by a normal-mode model. In this problem they show how the processor can be structured to estimate the vertical wave numbers directly from measured pressure-field and sound speed measurements thereby eliminating the need for synthetic aperture processing or even a propagation model solution. Finally, they investigate various special cases of the source localization problem, designing a model-based localizer for each and evaluating the underlying structure with the expectation of gaining more and more insight into the general problem.

1676 (WHC-SD-WM-ATP–103) **Void fraction instrument acceptance test procedure.** Pearce, K.L. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1994. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001514. Source: OSTI; NTIS; INIS; GPO Dep.

This acceptance test procedure (ATP) was written to test the void fraction instrument (VFI) and verify that the unit is ready for field service. The procedure verifies that the mechanical and electrical features (not specifically addressed in the software ATP) and software alarms are operating as designed.

45 MILITARY TECHNOLOGY, WEAPONRY, AND NATIONAL DEFENSE

Refer also to citation(s) 2556

1677 (CONF-8512135–Summ.) **Advances in technology for the construction of deep-underground facilities.** National Committee on Tunneling Technology, Washington, DC (United States); National Committee for Rock Mechanics, Washington, DC (United States). 1987. 102p. Sponsored by USDOE, Washington, DC (United States);Defense Nuclear Agency, Washington, DC (United States). DOE Contract AI05-86ER40298. From Advances in technology for the construction of deep-underground facilities conference; Reston, VA (United States); 12-14 Dec 1985. Order Number DE94015607. Source: OSTI; NTIS; GPO Dep.

The workshop was organized in order to address technological issues important to decisions regarding the feasibility of strategic options. The objectives of the workshop were to establish the current technological capabilities for deep-underground construction, to project those capabilities through the compressed schedule proposed for construction, and to identify promising directions for timely allocation of existing research and development resources. The earth has been used as a means of protection and safekeeping for many centuries. Recently, the thickness of the earth cover required for this purpose has been extended to the 2,000- to 3,000-ft range in structures contemplated for nuclear-waste disposal, energy storage, and strategic systems. For defensive missile basing, it is now perceived that the magnitude of the threat has increased through better delivery systems, larger payloads, and variable tactics of attack. Thus, depths of 3,000 to 8,000 ft are being considered seriously for such facilities. Moreover, it appears desirable that the facilities be operational (if not totally complete) for defensive purposes within a five-year construction schedule. Deep excavations such as mines are similar in many respects to nearsurface tunnels and caverns for transit, rail, sewer, water, hydroelectric, and highway projects. But the differences that do exist

are significant. Major distinctions between shallow and deep construction derive from the stress fields and behavior of earth materials around the openings. Different methodologies are required to accommodate other variations resulting from increased depth, such as elevated temperatures, reduced capability for site exploration, and limited access during project execution. This report addresses these and other questions devoted to geotechnical characterization, design, construction, and excavation equipment.

1678 (LA-SUB--94-141) **Prototype integration of the joint munitions assessment and planning model with the OSD threat methodology.** Lynn, R.Y.S.; Bolmarcich, J.J. Los Alamos National Lab., NM (United States); Quantics, Inc., Exton, PA (United States). Jun 1994. 136p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001401. Source: OSTI; NTIS; GPO Dep.

The purpose of this Memorandum is to propose a prototype procedure which the Office of Munitions might employ to exercise, in a supportive joint fashion, two of its High Level Conventional Munitions Models, namely, the OSD Threat Methodology and the Joint Munitions Assessment and Planning (JMAP) model. The joint application of JMAP and the OSD Threat Methodology provides a tool to optimize munitions stockpiles. The remainder of this Memorandum comprises five parts. The first is a description of the structure and use of the OSD Threat Methodology. The second is a description of JMAP and its use. The third discusses the concept of the joint application of JMAP and OSD Threat Methodology. The fourth displays sample output of the joint application. The fifth is a summary and epilogue. Finally, three appendices contain details of the formulation, data, and computer code.

1679 (LA-SUB--94-148) **Outline of an on-site inspection regime for conventional arms control in Europe.** Los Alamos National Lab., NM (United States); BDM Corp., McLean, VA (United States). [1994]. 9p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001742. Source: OSTI; NTIS; GPO Dep.

The complexity of the negotiations on Conventional Forces in Europe (CFE) was emphasized recently by General John R. Galvin, SACEUR, when he stated, "The difficulties of comparing the relative strengths of strategic or intermediate-range nuclear arsenals pale in comparison with the problems of assessing the relative capabilities of opposing conventional forces." Throughout this process, intensive and rigorous verification measures must be developed and enforced to ensure an acceptable degree of reliability. The eventual agreement will require a complex verification monitoring process covering a vast geographical area. The long-term success of the agreement to a large extent will depend on the level of confidence achieved by the verification process and the effective deployment of technological means will be essential to that process.

1680 (SAND--90-7083) **Experimental investigation of the wake behind a solid disk.** Balligand, H. (Syracuse Univ., NY (United States). Dept. of Mechanical, Aerospace and Mfg. Engineering); Higuchi, Hiroshi. Sandia National Labs., Albuquerque, NM (United States); Syracuse Univ., NY (United States). Dept. of Mechanical, Aerospace and Mfg. Engineering. Dec 1993. 168p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. N62269-92-C-0229. Order Number DE95002317. Source: OSTI; NTIS; GPO Dep.

The flow past a solid circular disk placed in time-dependent approaching stream velocity was investigated experimentally. The model was near-impulsively started from rest and moved at a constant speed. The wake behind the disk remained axisymmetric when the disk was traversed for a short distance. The scaling effect of varying the acceleration rate and the subsequent constant velocity on the wake evolution was investigated by detailed flow visualizations. The drag measurement indicated an initial maximum force dependent on the acceleration rate before it decreased toward the quasi-steady value. The model was subsequently decelerated at various rates, either to rest or to a second constant velocity. The wake overtook the disk in most cases depending of the values of both deceleration rate and velocity ratio. The force measurement showed that the drag acting on the disk became negative shortly after the onset of deceleration and reached its most negative value approximately at the end of the deceleration. The peak negative drag correlated with the deceleration rate. During the deceleration to a second velocity the drag became negative even when the vortex structure remained downstream of the disk. When the disk was subjected to constant speeds for a prolonged time, onset of asymmetry of the vortex structure occurred, eventually leading to a three-dimensional wake. Finally, the wake behind the disk was compared with the two-dimensional counterpart, using a rectangular flat plate. One of the prime motivations for studying the wake behind bluff bodies during acceleration and deceleration phases is to achieve a better understanding of the unsteady flow phenomena associated with the opening and early phase of deceleration of a parachute.

1681 (SAND--93-4018C) **Experimental and numerical investigation of shock-induced full vaporization of zinc.** Brannon, R.M.; Chhabildas, L.C. Sandia National Labs., Albuquerque, NM (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410131--9: 1994 hypervelocity impact symposium, Santa Fe, NM (United States), 16-20 Oct 1994). Order Number DE95002185. Source: OSTI; NTIS; GPO Dep.

Prediction of the interaction between expanded vaporized debris and target materials for applications such as meteorite impact on space vehicles, ballistic penetration of armors, debris shield design, etc. demands an accurate treatment of the melting and vaporization process and the kinetics of liquid-vapor propagation. A systematic computational and experimental study is presented on shock-induced full vaporization of zinc resulting from record-high impact speeds recently achieved on the Sandia Hyper-Velocity Launcher. In these experiments, a thin target plate of zinc is impacted by a tantalum flier plate at speeds ranging from 8 to 10.1 km/s, producing pressures from 3 Mbar to over 5.5 Mbar and temperatures as high as 3,900 K. Such high pressures produce essentially full vaporization of the zinc because the thermodynamic release isentropes pass into the vapor dome near the critical point. To characterize vapor flow. the velocity history produced by stagnation of the zinc expansion products against a witness plate is measured with velocity interferometry. For each experiment, the time-resolved experimental interferometer record is compared with wavecode calculations using an analytical equation of state, called ANEOS, that is known to have performed well at lower impact speeds where vaporization is negligible. Significant discrepancies between experiment and calculation are shown to exist under conditions of the more recent higher impact speeds in excess of 7km/s. Numerical predictions underestimate witness-plate velocity for impact speeds up to about 9 km/s but overestimate witness-plate velocity for impact exceeding 9 km/s.

1682 (SAND--93-4074C) **A comparison of phase change phenomena in CTH with experimental data.** Hertel, E.S. Jr. (Sandia National Labs., Albuquerque, NM (United States)); McIntosh, R.L.; Patterson, B.C. Sandia National Labs., Albuquerque, NM (United States). [1993]. 11p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410131--8: 1994 hypervelocity impact symposium, Santa Fe, NM (United States), 16-20 Oct 1994). Order Number DE95001608. Source: OSTI; NTIS; GPO Dep.

An estimate of the current state of the predictive capabilities of hydrocodes for impacts where phase changes may be important was made by simulating a series of experiments where zinc spheres impact thin zinc plates at 4 velocities. The experimental data was taken from Mullin, et al. and consisted of radiographs of the debris cloud and estimates of the momentum in the debris cloud along the velocity vector. The velocities ranged from 3.30 to 6.79 km/s indicating that the debris consists of solid/molten fragments to predominantly vapor phase material as the velocity increases. The simulations reveal that the CTH hydro can accurately predict the debris structure and momentum transfer for this class of impacts.

1683 (SAND--94-1016C) **Characterization of ignition overpressure using band limited temporal moments.** Cap, J.S. (Sandia National Labs., Albuquerque, NM (United States). Experimental Structural Dynamics Dept.). Sandia National Labs.,

Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410187–3: Shock and vibration symposium, San Diego, CA (United States), 31 Oct 1994). Order Number DE95002182. Source: OSTI; NTIS; GPO Dep.

The ignition overpressure event is a transient vibroacoustic environment which occurs when a missile is launched. The environment is often too short to obtain a good estimate of the event using Power Spectral Densities, and Shock Response Spectra are limited in their ability to fully describe the nature of the environment. Sandia National Laboratories has employed band limited temporal moments in an effort to characterize the acceleration response of the components and payloads to the ignition overpressure environment and the related laboratory test inputs. The purpose of this paper will be to show the results of that study.

1684 (SAND–94-2144C) **Gunfire characterization and simulation using temporal moments.** Smallwood, D.O. Sandia National Labs., Albuquerque, NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410187–1: Shock and vibration symposium, San Diego, CA (United States), 31 Oct 1994). Order Number DE94017403. Source: OSTI; NTIS; GPO Dep.

The concept of band-limited temporal moments is briefly reviewed. An input-output relationship for the band-limited product model is derived. The band-limited product model is then used to characterize and simulate a gunfire record in the following manner. An ensemble of 50 gunfire rounds are averaged to determine the mean response. The mean is subtracted from the original record and the remaining signal is characterized using a smoothed mean square response of the signal filtered into contiguous bandwidths. This operation preserves the lower bandlimited temporal moments of the original data. This smoothed mean square response was used as the deterministic window for the product model. The power spectrum of the response with the mean removed is used to estimate the spectrum for the random part a product model. An additional step varied the repetition rate in a random manner of the simulated gunfire rounds to match the original record in a statistical sense.

1685 (SAND–94-2361) **Electromagnetic scattering from buried objects.** Brock, B.C.; Sorensen, K.W. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001858. Source: OSTI; NTIS; INIS; GPO Dep.

Radar imaging and detection of objects buried in soil has potentially important applications in the areas of nonproliferation of weapons, environmental monitoring, hazardous-waste site location and assessment, and even archeology. In order to understand and exploit this potential, it is first necessary to understand how the soil responds to an electromagnetic wave, and how targets buried within the soil scatter the electromagnetic wave. We examine the response of the soil to a short pulse, and illustrate the roll of the complex dielectric permittivity of the soil in determining radar range resolution. This leads to a concept of an optimum frequency and bandwidth for imaging in a particular soil. We then propose a new definition for radar cross section which is consistent with the modified radar equation for use with buried targets. This radar cross section plays the same roll in the modified radar equation as the traditional radar cross section does in the free-space radar equation, and is directly comparable to it. The radar cross section of several canonical objects in lossy media is derived, and examples are given for several object/soil combinations.

1686 (SCL-DR–720025) **SPINFIN: A computer program for trajectory simulation of flight vehicles with semi-passive roll control systems.** Kryvoruka, J.K. Sandia National Labs., Albuquerque, NM (United States). Jul 1972. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001571. Source: OSTI; NTIS; GPO Dep.

This report presents the trajectory computer program, SPINFIN. The program has been in use at Sandia Laboratories, Livermore, for flight simulation of those reentry vehicles which utilize a class of semi-passive fin roll-control systems. As such, it has served as an important design tool for some time. The report includes a presentation of the prominent features of the mathematical model which describes the vehicle aero-, flight-, and control-system dynamics. Additionally, detailed descriptions of the program input and output are provided as a user's guide.

4501 Chemical Explosions and Explosives

Refer also to citation(s) 291, 1440

1687 (LA-UR–94-3316) **Characterization of high-explosive initiation and safety at Los Alamos.** McAfee, J.M. Los Alamos National Lab., NM (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410215–2: Microscopic and macroscopic approaches to detonation workshop, St. Malo (France), 1-8 Oct 1994). Order Number DE95001011. Source: OSTI; NTIS; GPO Dep.

The Chapman-Jouget and ZND models of steady detonation have proved most useful for engineering estimation of the propagation of near-planar, steady detonation in short-reaction-zone explosives. However, even in well characterized systems, the purposeful initiation of detonation is not described by these models. The highly divergent and microscopic nature of point initiation require discerning experiments, modeling, and theoretical analysis. Recently, safety considerations in complex or damaged systems, possibly containing long-reaction-zone (insensitive) high explosives, have dominated the author's thinking. These situations are rarely planar or steady, the physical state of the explosive may not be easily characterized, and there is a wide range of potential stimuli. The high-explosive reaction may range from none, to deflagration, to partial detonation, or to full detonation. Techniques and data applicable to estimating the level of response are needed.

1688 (SAND–94-8239) **The permeation of bis(2-fluoro-2,2-dinitroethyl) formal (FEFO), ethyl 4,4-dinitropentanoate (EDNP), ethyl 4-nitropentanoate (ENP), and 1,2,4-trichlorobenzene (TCB) through barrier membranes.** Shepodd, T.J. (Sandia National Labs., Livermore, CA (United States)); Daniel, A.R.; Buffleben, G.M.; Foster, P. Sandia National Labs., Livermore, CA (United States). Oct 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002492. Source: OSTI; NTIS; GPO Dep.

In support of the manufacture and storage of paste explosives, several membrane materials were evaluated as barriers to permeation. The permeation was quantified to evaluate leakage of the fluids from paste explosives during long-term storage. Four permeants were evaluated, though not every permeant was evaluated with every material. Mass uptake measurements were made during prolonged submersion of the materials in the permeants. Equilibrium amount absorbed and rate of absorption were used to calculate the diffusivity, and permeability of the given solvent/polymer pair. Permeabilities through membrane materials were judged using a cutoff of 10^{-10} mol s^{-1} m^{-1} above which permeation was unacceptably high. None of the materials tested was suitable for containing TCB at 125°C. Additionally, PFA was unacceptable at 75°C. Viton showed unacceptable permeation in ENP, but FEP and PFA were effective barriers for ENP. No significant differences were found in the permeabilities of different thicknesses of FEP and PFA with ENP. All of the materials (including the elastomer Kalrez) tested with both the explosive FEFO and the propellant EDNP were adequate barriers to their permeation. Polyethylene is unsuitable for contact with FEFO at elevated temperatures because of chemical reactions that occur with the polymer.

1689 (SAND–94-8709C) **Thermal decomposition reactions of HMX and RDX and their importance in predicting cookoff hazards.** Behrens, R. Jr. (Sandia National Labs., Livermore, CA (United States)); Bulusu, S. Sandia National Labs., Livermore, CA (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408123–4: 1994 joint Army, Navy, NASA, Air Force (JANNAF) propulsion systems hazards meeting, San Diego, CA (United

States), 1-5 Aug 1994). Order Number DE95002486. Source: OSTI; NTIS; GPO Dep.

Recent work on the decomposition of hexahydro-1,3,5-trinitro-s-triazine (RDX) and octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), utilizing simultaneous thermogravimetric modulated beam mass spectrometry (STMBMS), has shown that they undergo significant decomposition in both the solid and liquid phases. Previous studies have determined the mechanisms of several reaction pathways that control the decomposition of these materials. This paper presents a summary of this previous work and how the results can be applied to developing models to predict the response of energetic materials in cookoff situations.

4502 Nuclear Explosions and Explosives

Refer also to citation(s) 291, 318, 321, 547, 1293, 1449, 1789

1690 (CONF-9309103–Vol.1) **Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 1.** Olsen, C.W. (ed.). Lawrence Livermore National Lab., CA (United States). [1993]. 336p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. From 7. symposium on containment of underground nuclear explosions; Kent, WA (United States); 13-17 Sep 1993. Order Number DE95001257. Source: OSTI; NTIS; INIS; GPO Dep.

This is Volume 1 of two unclassified volumes of a meeting of workers at all levels in the science and technology of containment. Papers on containment and related geological, geophysical, engineering, chemical, and computational topics were included. Particular topics included in this volume are: General containment,tunnel and LOS topics, cavity conditions, and LYNER and chemical kiloton. Individual papers are indexed separately on the data base.

1691 (CONF-9309103–Vol.2) **Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 2.** Olsen, C.W. (ed.). Lawrence Livermore National Lab., CA (United States). [1993]. 431p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. From 7. symposium on containment of underground nuclear explosions; Kent, WA (United States); 13-17 Sep 1993. Order Number DE95001250. Source: OSTI; NTIS; INIS; GPO Dep.

This is Volume 2 of two unclassified volumes of a meeting of workers at all levels in the science and technology of containment. Papers on containment and related geological, geophysical, engineering, chemical, and computational topics were included. Particular topics in this volume include: Low-yield test beds, modeling and residual stress, material properties, collapse phenomena and shock diagnostics, stemming practices and performance, geophysics, and geosciences and weapons destruction. Individual papers are indexed separately on the data base.

1692 (DOE/HR–0096) **The Manhattan Project: Making the atomic bomb.** United States Department of Energy: Energy history series. Gosling, F.G. USDOE Assistant Secretary for Human Resources and Administration, Washington, DC (United States). Sep 1994. 66p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI (Free of Charge).

This article is a short history of the origins and development of the American atomic bomb program during World War II. Beginning with the scientific developments of the pre-war years, the monograph details the role of US government in conducting a secret, nationwide enterprise that took science from the laboratory and into combat with an entirely new type of weapon. The monograph concludes with a discussion of the immediate postwar period, the debate over the Atomic Energy Act of 1946, and the founding of the Atomic Energy Commission.

1693 (LA-UR–94-3170) **Preconceptual engineering design for the APT ^{3}He Target/Blanket concept.** Mensink, D.L. (Babcock and Wilcox Co., Lynchburg, VA (United States). Naval Nuclear Fuel Division); Rose, S.C. Jr. Los Alamos National Lab., NM (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950145–1: Conference on accelerator-driven transmutation technologies and applications (A-DTTA), Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95000920. Source: OSTI; NTIS; INIS; GPO Dep.

A preconceptual engineering design has been developed for the ^{3}He Target/Blanket (T/B) System for the Accelerator Production of Tritium Project. This concept uses an array of pressure tubes containing tungsten rods for the neutron spallation source and ^{3}He gas contained in a metal tank and blanket tubes as the tritium production material. The engineering design is based on a physics model optimized for efficient tritium production. Principle engineering consideration were: provisions for cooling all materials including the ^{3}He gas; containment of the gas and radionuclides; remote handling; material compatibility; minimization of ^{3}He, D_2O, and activated waste; modularity; and manufacturability. The design provides a basis for estimating the cost to implement the system.

1694 (LA-UR–94-3171) **Safety approach and engineered safety systems for the APT ^{3}He Target/Blanket System.** Rose, S.C. Jr. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950145–2: Conference on accelerator-driven transmutation technologies and applications (A-DTTA), Albuquerque, NM (United States), 8-12 Jan 1995). Order Number DE95000919. Source: OSTI; NTIS; INIS; GPO Dep.

A preconceptual design has been developed for the ^{3}He Target/Blanket (T/B) System for the Accelerator Production of Tritium (APT) Project. A major part of the design effort was to develop the safety approach and engineered safety systems for this system. The APT safety approach has been developed to ensure with high confidence that a beam trip will occur and adequate cooling will be provided if the target/blanket parameters deviate from the design operating range. The safety approach uses redundant and diverse systems to ensure high reliability for tripping the beam and removing the decay heat. This paper describes the general safety approach and its use of inherent safety features and active- and passive-engineered safety systems to meet or exceed the requirements.

1695 (SAND–93-7054/1) **Historical sketches of Sandia National Laboratories nuclear field testing: Volume 1: Full discussion except for sensitive references.** Banister, J.R. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95002953. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains historical sketches that cover the major activities of Sandia nuclear field testing, from early atmospheric shots until 1990. It includes a chronological overview followed by more complete discussions of atmospheric, high-altitude, underwater, cratering, and underground nuclear testing. Other activities related to nuclear testing and high-explosive tests are also described. A large number of references are cited for readers who wish to learn more about technical details. Appendices, written by several authors, provide more insight for a variety of special aspects of nuclear testing and related work. Two versions of this history were published: volume 1 has an unlimited distribution, and volume 2 has a limited distribution.

4503 Nuclear Explosion Detection

1696 (SAND–94-1817C) **Thermal design of the fast-on-orbit recording of transient events (FORTE) satellite.** Akau, R.L. (Sandia National Labs., Albuquerque, NM (United States)); Behr, V.L.; Whitaker, R. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408132–3: AIAA small satellite conference, Logan, UT (United States), 29 Aug - 1 sep 1994). Order Number DE95001621. Source: OSTI; NTIS; GPO Dep.

Analytical tools were used to design a thermal control system for the FORTE satellite. An overall spacecraft thermal model was developed to provide boundary temperatures for detailed thermal models of the FORTE instruments. The thermal design will be presented and thermal model results discussed.

1697 (SAND–94-2143) **Tonopah Test Range EGS graphics tracking display system: HP370.** Meyer, R.H.; Bauhs, K.C. Sandia National Labs., Albuquerque, NM (United States). Aug 1994. 437p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001796. Source: OSTI; NTIS; GPO Dep.

This report describes the HP370 component of the Enhanced Graphics System (EGS) used at Tonopah Test Range (TTR). Selected Radar data is fed into the computer systems and the resulting tracking symbols are displayed on high-resolution video monitors in real time. These tracking symbols overlay background maps and are used for monitoring/controlling various flight vehicles. This report discusses both the operational aspects and the internal configuration of the HP370 Workstation portion of the EGS system.

4505 Strategic Defense Initiative

Refer also to citation(s) 793

1698 (SAND–94-0378C) **A Hypervelocity Experimental Research Database (HERD): Support for the Wright Laboratory Armament Directorate Code Validation Program (COVAL).** Mullin, S.A. (Southwest Research Institute, San Antonio, TX (United States). Materials and Mechanics Dept.); Anderson, C.E. Jr.; Hertel, E.S. Jr.; Hunt, R.D. Sandia National Labs., Albuquerque, NM (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9409211–4: American Institute of Aeronautics and Astronautics space programs and technologies conference and exhibit, Birmingham, AL (United States), 27 Sep 1994). Order Number DE95001628. Source: OSTI; NTIS; GPO Dep.

The Hypervelocity Experimental Research Database (HERD) described in this paper was developed to aid researchers with code validation for impacts that occur at velocities faster than the testable regime. Codes of concern include both hydrocodes and fast-running analytical or semi-empirical models used to predict the impact phenomenology and damage that results to projectiles and targets. There are several well documented experimental programs that can serve as benchmarks for code validation; these are identified and described. Recommendations for further experimentation (a canonical problem) to provide validation data are also discussed.

1699 (SAND–94-1606C) **Missile sizing for ascent-phase intercept.** Hull, D.G. (Univ. of Texas, Austin, TX (United States). Dept. of Aerospace Engineering and Engineering Mechanics); Salguero, D.E. Sandia National Labs., Albuquerque, NM (United States). [1994]. 7p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9408177–1: American Institute of Aeronautics and Astronautics (AIAA) atmospheric flight mechanic conference, Scottsdale, AZ (United States), 1-3 Aug 1994). Order Number DE95001881. Source: OSTI; NTIS; GPO Dep.

A computer code has been developed to determine the size of a ground-launched, multistage missile which can intercept a theater ballistic missile before it leaves the atmosphere. Typical final conditions for the inteceptor are 450 km range, 60 km altitude, and 80 sec flight time. Given the payload mass (35 kg), which includes a kinetic kill vehicle, and achievable values for the stage mass fractions (0.85), the stage specific impulses (290 sec), and the vehicle density (60 lb/ft^3), the launch mass is minimized with respect to the stage payload mass ratios, the stage burn times, and the missile angle of attack history subject to limits on the angle of attack (10 deg), the dynamic pressure (60,000 psf), and the maneuver load (200,000 psf deg). For a conical body, the minimum launch mass is approximately 1900 kg. The missile has three stages, and the payload coasts for 57 sec. A trade study has been performed by varying the flight time, the range, and the dynamic pressure Emits. With the results of a sizing study for a 70 lb payload and q_{max} = 35,000 psf, a more detailed design has been carried out to determine heat shield mass, tabular aerodynamics, and altitude dependent thrust. The resulting missile has approximately 100 km less range than the sizing program predicted primarily because of the additional mass required for heat protection. On the other hand, launching the same missile from an aircraft increases its range by approximately 100 km. Sizing the interceptor for air launch with the same final conditions as the ground-launched missile reduces its launch mass to approximately 1000 kg.

4506 Chemical and Biological

1700 (UCRL-CR–118446) **Validation of an in vitro test method to evaluate materials against liquid HD.** Reifenrath, W.; Bergman, W. Lawrence Livermore National Lab., CA (United States). 29 Aug 1994. 49p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95002399. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed an in vitro test method for evaluating the protection of various materials against liquid HD (mustard) exposure to human skin. The test method is based on using live pig skin as a biological detector for HD penetration through the test materials. The test method is similar to the apparatus and procedures developed at the Letterman Army Institute of Research. We have conducted a preliminary validation of the in vitro test method using HD exposure on live rabbits. Extensive preparations for conducting additional in vitro tests on various materials and conducting additional validation tests at the Illinois Institute of Technology Research Institute were completed and approved. However, these additional tests were not completed because of unplanned cost overruns.

54 ENVIRONMENTAL SCIENCES

Refer also to citation(s) 1412, 2513

1701 (INIS-mf–14392, pp. 217-231) **The management of site contamination.** Ginot, P. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The management of off site contamination has been described and discussed. It is usual to distinguish three phases during the course of a severe accident with off site consequences: accidental phase, post-accidental phase and remediation phase. The recommendations of International Commission for Protection against Radiation are a help and a good guide how to organize the remediation action and the counter measures in all phases of the accident. 12 figs.

5401 Environmental Sciences, Atmospheric

Refer also to citation(s) 59, 60, 71, 241, 286, 443, 453, 471, 473, 497, 515, 579, 587, 717, 718, 742, 920, 965, 1043, 1346, 1657, 1664, 1666, 1793, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1822, 1825, 1845, 1848, 1950, 1952, 1953, 1955, 1960, 1961, 1962, 1963, 1964, 1965, 1968

1702 (ANSTO/E–708) **Environmental survey at Lucas Heights Research Laboratories, 1991.** Hoffmann, E.L.; Looz, T. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). May 1994. 55p. Order Number DE95606034. Source: OSTI; NTIS (US Sales Only); INIS.

In common with many other nuclear facilities, ANSTO undertakes an extensive program of meteorological measurements. The prime reason for such a program is to allow estimates to be made of the downwind concentration of any airborne pollutants, particularly radionuclides, released from the site through routine operations or under accident conditions. The data collection from this program provide the necessary input to the atmospheric dispersion model called ADDCOR (ANSTO 1989) which can be used to compute the effective dose to an individual due to the routine airborne or accidental release of radionuclides from the LHRL. None of the samples taken from possible human food chains in the

vicinity of the Lucas Heights Research Laboratories contained radioactivity which could be attributed to the operation of the site. Discharges of airborne radioactive gases were within authorised limits when averaged over the year. The dose to the most sensitive members of the public from iodine-131 release, was $< 0.4 \times 10^{-3}$ mSv/year and the calculated dose from released noble gases to the most exposed individuals was less than 0.01 mSv/year. These figures represent less than one per cent of the most restrictive limits recommended by the National Health and Medical Research Council of Australia. The annual average liquid effluent discharge to the Water Board Sewer during 1991 was less than 29 per cent of the permitted level. For tritium, the concentration was less than 2 per cent of the specified limit. The data presented in this report clearly shows that the environmental impact of operations at LHRL has been very low. The effective dose to residents living in the immediate neighbourhood of the reactor are very difficult to measure directly but calculated dose estimates are far lower than those due to natural background radiation and medical exposures. 24 refs., 19 tabs., 4 figs.

1703 (ANSTO/E–709) **Environmental survey at Lucas Heights Research Laboratories, 1992.** Hoffman, E.L.; Loosz, T. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Jul 1994. 59p. Order Number DE95606035. Source: OSTI; NTIS (US Sales Only); INIS.

This report summarises the results from the environmental survey during 1992 and assesses the effects of radioactive discharges on both local population and the environment. None of the samples taken from possible human food chains in the vicinity of the Lucas Heights Research Laboratories contained radioactivity which could be attributed to the operation of the site. The data presented din this report clearly shows that the environmental impact of operations at LHRL has been very low. The effective dose to residents living in the immediate neighbourhood of the reactor are very difficult to measure directly but calculated dose estimates are far lower than those due to natural background radiation and medical exposures. Discharges of airborne radioactive gases were within authorised limits when averaged over the year. The dose to the most sensitive members of the public from iodine-131 releases, was $<0.5 \times 10^{-2}$ mSv/year and the calculated dose from released noble gases to the most exposed individuals was less than 0.01 mSv/year. These figures represent less than one per cent of the limits recommended by the National Health and Medical Research Council of Australia. The monthly average liquid effluent discharge to the Water Board Sewer during 1992 was less than 30 per cent of the permitted level for all periods except May which rose to 62 per cent. For tritium, the concentration was less than 2 per cent of the specified limit. 23 refs., 19 tabs., 5 tabs.

1704 (CONF-9311249–1) **Preventing atmospheric ammonia emissions: A generator/regulator solution.** Breed, C.E.; Holt, M.T. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 6p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–357). From National roundtable of state pollution prevention programs; Nashville, TN (United States); 2-5 Nov 1993. Order Number DE95001735. Source: OSTI; NTIS.

During most of the 60 years that TVA has been in existence, the research center at Muscle Shoals, Alabama, NERC, was charged with supporting the regional and national agribusiness industry. One aspect of this support was strong emphasis on fertilizer process and product development. One such product developed at the center was a liquid fertilizer with a grade of 10-34-0 ($N\text{-}P_2O_5\text{-}K_2O$). The process was profitable and easy to operate, the product was well accepted by both farmers and dealers, and 10-34-0 became the premium phosphate fertilizer used in the United States. Approximately 120 to 130 of these type units have been constructed and operated in the United States in the last 20 years. During that time, the process design has remained essentially unchanged. The direct contact between the hot fertilizer product and the air results in some free ammonia being stripped from the product and emitted from the top of the cooling tower. At the time most of the plants were constructed, there was little concern over these losses because (1) there were very few regulations dealing with ammonia and (2) most of the plants were originally built and operated in rural areas away from population centers and emissions that occurred went essentially unnoticed. However, as a result of this study, process changes that can reduce ammonia, as well as fluoride and particulate emissions have been identified and mad available to generators. In addition a potential process for the total elimination of emissions has been developed and made available on a trial basis.

1705 (DOE/EIA–0573(11/94)) **Emissions of greenhouse gases in the United States: 1987–1992.** USDOE Energy Information Administration, Washington, DC (United States). Office of Energy Markets and End Use. Nov 1994. 125p. Sponsored by US-DOE, Washington, DC (United States). Order Number DE95003001. Source: OSTI; NTIS; GPO Dep.

This is the second annual Energy Information Administration (EIA) report on US emissions of greenhouse gases. This report presents estimates of US anthropogenic (human-caused) emissions of carbon dioxide, methane, nitrous oxide, and several other greenhouse gases for the period 1987 to 1992. Estimates of 1993 carbon dioxide emissions are also provided, although complete 1993 estimates for other gases are not yet available. Many of the estimates in this report have been revised from the first EIA report. Estimates of carbon dioxide emissions were revised upward by about 25 million metric tons of carbon dioxide (0.5 percent) for each year as a result of revised emissions coefficients and revised estimates of nonfuel use of fossil fuels. Methane emissions estimates were revised downward by about 2 million metric tons (6.6 percent) for each year as a result of changes in estimation methods.

1706 (DOE/ER/60662–T3) **Transport of radon and thoron at the Earth's surface: Final report, April 1, 1988–June 30, 1994.** Schery, S.D.; Wasiolek, P. New Mexico Inst. of Mining and Technology, Socorro, NM (United States). Dept. of Physics. 1 Jul 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG04-88ER60662. Order Number DE95003000. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of the proposed research is to improve the authors understanding of physical processes controlling the concentration of radon, thoron, and their progeny in the atmospheric environment. This information is important for understanding dose delivered to the respiratory track at the breathing level. For the proposed three-year period, emphasis will be on studies, including particle size information, of the disequilibrium between radon, thoron, and their progeny. Thoron will receive special attention because of its rising importance as an indoor pollutant and insufficient study, so far, in the DOE radon program. Indoors the mixing of thoron in rooms and the disequilibrium between it and its progeny will be measured and modeled. Outdoors the disequilibrium of both isotopes and their progeny will be studied as a function of height and meteorological conditions with particular attention to size partitions at the breathing level. Models predicting disequilibrium for both attached and unattached progeny will be tested and refined. Metrology and instrumentation development related to the preceding tasks will be explored, including improved thoron gas measurement and measurement of flux density.

1707 (DOE/ER/61030–T1) **Exposure to radon and radon progeny in the indoor environment: Final report.** Socolow, R.H. Princeton Univ., NJ (United States). Center for Energy and Environmental Studies. [1994]. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61030. Order Number DE95001798. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the work done by the Center for Energy and Environmental Studies at Princeton University as part of the radon research program. It involves radon measurements in various buildings, as well as the use of natural ventilation to mitigate radon levels. The report is divided into four chapters: The use of radon entry rate measurements to understand radon concentration in buildings; Use of natural basement ventilation to control radon in single family dwellings; The effect of natural ventilation on radon and radon progeny levels in houses; and Comparison of natural and forced ventilation for radon mitigation in houses.

1708 (DOE/ER/61071–T1) **An integrated cloud observation and modeling investigation in support of the ARM Program: Annual technical progress report, November 1,**

1993–October 31, 1994. Pennsylvania State Univ., University Park, PA (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61071. Order Number DE95002798. Source: OSTI; NTIS; GPO Dep.

Work continued on the development of techniques for defining cloud properties from the 94 GHz cloud radar. Information, in the form of a submitted manuscript, has been developed about the use of radar to determine cloud boundary statistics and cloud structure with specific applications to marine boundary layer clouds, a mid-latitude cyclone, and cirrus. In addition a comparison of the aircraft and radar observations and a description of how data from the radar can be combined with other remote sensing systems is included. Mesoscale numerical modelling within the Penn State DOE-ARM research program has continued. In order to study the response of clouds to various forcing functions, development continues on a detailed numerical model of the microphysical processes known to operate in the atmosphere during the cloud and precipitation formation.

1709 (DOE/ER/61447–1) **A report on workshops: General circulation model study of climate- chemistry interaction.** Wei-Chyung, Wang (State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center); Isaksen, I.S.A. State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center. [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER61447. (CONF-9208255–Summ.: Workshop on general circulation model study: climate-chemistry interactions; Workshop on general circulation model study: climate-chemistry interactions, Oslo (Norway); Albany, NY (United States), 19-21 Aug 1992; 26-27 may 1993; CON Order Number DE94010252. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the discussion on General Circulation Model Study of Climate-Chemistry Interaction from two workshops, the first held 19–21 August 1992 at Oslo, Norway and the second 26–27 May 1993 at Albany, New York, USA. The workshops are the IAMAP activities under the Trace Constituent Working Group. The main objective of the two workshops was to recommend specific general circulation model (GCM) studies of the ozone distribution and the climatic effect of its changes. The workshops also discussed the climatic implications of increasing sulfate aerosols because of its importance to regional climate. The workshops were organized into four working groups: observation of atmospheric O_3; modeling of atmospheric chemical composition; modeling of sulfate aerosols; and aspects of climate modeling.

1710 (DOE/ER/61578–1, pp. 1-6) **Budgets and balances in a warmer world.** Boer, G.J. (Canadian Climate Centre, Downsview, Ontario (Canada)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Potential climate warming is studied by performing the "first standard CO2 experiment" which consists of coupling a comparatively sophisticated atmospheric general circulation model to a thermodynamically, but not dynamically, active ocean/ice model. The differences in the equilibrium climates simulated for the current or 1xCO2 case and for the new equilibrium climate that results with twice that amount of CO2 are investigated. Results indicate that although the dynamical consequences of greenhouse gas warming are not as marked nor statistically significant as the thermodynamical changes, they display an intriguing rearrangement of flow structures which take advantage of the altered thermodynamic structures in the atmosphere that occur. Since the overall forcing does not change appreciably, the poleward transport of energy remains the same but this is accomplished by an increase in latent energy transport associated with a warmer and moister lower troposphere which balances a decrease in internal and potential energy transport associated with weaker temperature gradients in this region.

1711 (DOE/ER/61578–1, pp. 7-13) **An observational study of the interaction between the synoptic-scale eddies and the intra-seasonal fluctuations in the atmosphere.** Derome, J.; Sheng, J.; Lin, H.; Klasa, M. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

It is clear from the kinetic energy spectrum published by Vinnichenko in 1970 that the atmospheric fluctuations with periods between about 10 and 100 days form a very important part of the atmospheric flow. These oscillations, often called low-frequency or intra-seasonal fluctuations, could result from an instability of the time-mean flow, from an interaction with the oceans, or from a nonlinear transfer of energy from the faster synoptic-scale eddies. In the present study we concentrate on this last possibility and examine, with the help of atmospheric data and general circulation model (GCM) output, the extent to which the synoptic-scale eddies affect the low-frequency fluctuations.

1712 (DOE/ER/61578–1, pp. 14-23) **The role of eddy transports in climate change.** Stone, P.H. (Massachusetts Institute of Technology, Cambridge, MA (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Large-scale atmospheric eddies are the dominant transport mechanisms in mid and high latitudes. Thus, climate models must simulate these eddies, their effects, and their feedbacks accurately. Getting the feedbacks right is particularly important since it is the feedbacks which affect climate sensitivity. Observational studies of these feedbacks are hindered by the lack of actual climate changes for which good data is available, and by the lack of data on vertical heat fluxes. General circulation model (GCM) studies are hindered by errors in GCM simulations of transports in the current climate; the dependence of GCM results on uncertain subgrid scale parameterizations; and large computational requirements. A more promising approach for learning about eddy feedbacks and how they can be modelled is process model studies. So far these studies have only looked at the feedback between eddy sensible heat fluxes arising from baroclinic instability and the temperature structure. The results indicate that there is a very strong negative feedback between eddy fluxes and temperature structure, both meridional and vertical, with the fluxes themselves being sensitive to small changes in temperature structure. These studies need to be extended to higher vertical resolution, and to include the effects of moisture, stationary eddies, and coupling to the oceans.

1713 (DOE/ER/61578–1, pp. 24-33) **Rossby wave propagation and teleconnections for the Northern Hemisphere summer flow.** Ambrizzi, T.; Hoskins, B.J. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

To produce more confident predictions of global climate change, we have first to understand the climate itself. One way to do this is to use a numerical model in order to simulate a specific aspect observed in the atmosphere in an attempt to gain an insight into its dynamics. Teleconnection analysis comprises a global view of atmospheric circulation where local phenomena act to influence remote regions in the atmosphere. They have been used mainly to study large-scale low frequency fluctuations in the atmosphere. Their importance for long range weather forecasting, for instance, is obvious. The theory of Rossby wave propagation can largely explain patterns of wavetrains obtained in observations and in the results of models.

1714 (DOE/ER/61578–1, pp. 34-39) **Interannual variability of north Atlantic Sea surface temperatures.** Bhatt, U.S. (Univ. of Wisconsin, Madison, WI (United States)); Battisiti, D.S.; Alexander, M.A. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The*

role of large-scale, extratropical dynamics in climate change. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

In the midlatitude north Atlantic Ocean the pattern of sea surface temperature anomalies (ssta) is characterized by a north-south dipole. Bjerknes was the first to propose that the banded structure was associated with the interannual variability. Recently, these patterns have been studied more extensively. In this study the quantitative aspects of these patterns are examined through the use of a mixed-layer model (MLM).

1715 (DOE/ER/61578–1, pp. 40-41) **Climatic feedbacks between stationary and transient eddies.** Branscome, L.E. (Environmental Dynamics Research, Inc., Palm Beach Gardens, FL (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Stationary eddies make a significant contribution to poleward heat transport during Northern Hemisphere winter, equaling the transport by transient eddies. On the other hand, stationary eddy transport during the summer is negligible. The effect of topography on time-mean stationary waves and low-frequency variability has been widely studied. In contrast, little attention has been given to the climatic feedbacks associated with stationary eddies. Furthermore, the relationship between stationary and transient eddies in the context of global and regional climate is not well understood. The response of the climate system to anthropogenic forcing is likely to have some dependence on stationary wave transport and its interaction with transient eddies. Some early GCM simulations and observational analyses indicate a strong feedback between the meridional heat fluxes of stationary and transient eddies.

1716 (DOE/ER/61578–1, pp. 42-47) **Diagnosis of balanced and unbalanced motions in a synoptic-scale baroclinic wave life cycle.** Bush, A.B.G. (Univ. of Toronto, Ontario (Canada)); Peltier, W.R.; McWilliams, J.C. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

For numerical simulations of large scale dynamics, balanced models are attractive because their governing equations preclude gravity waves and one is thereby free to use a larger time step than is possible with a model governed by the primitive equations. Recent comparative studies have proven the so-called balance equations to be the most accurate of the intermediate models. In this particular study, a new set of balance equations is derived for a three-dimensional anelastic primitive equation simulation of a synoptic-scale baroclinic wave. Results indicate that both forms of imbalance. slow higher-order corrections and fast gravity wave motions, arise in the simulation. Investigations into the origin of these gravity waves reveal that the frontal slope near the time of occlusion decreases in the lower 2 kilometers to a value beyond compatability with the vertical and horizontal resolution employed, and we conclude that the waves are numerically generated.

1717 (DOE/ER/61578–1, pp. 48-52) **Low-frequency variation of a zonally localized jet stream: Observation and theory.** Cai, M. (Univ. of Maryland, College Park, MD (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The climatological mean circulation in the extratropics of the Northern Hemisphere is characterized by two zonally localized jet streams over the east coasts of the two major continents. The zonal inhomogeneity of the climatological mean circulation is believed to be a primary factor determining the geographical locations of the maximum activity centers of the atmospheric transients, such as storm tracks over the east coasts of the two major continents and frequent blocking episodes occurring over the central regions of the two oceans. The impact of the transients on the zonally localized jet streams is studied mostly in the linear dynamics framework in terms of so-called "feedback" diagnosis. This study investigates nonlinear instability of a zonally localized jet stream. The emphasis is on the nonlinear adjustment of a zonally localized jet stream associated with the development of the transients via local instability. The adjustment of a zonally localized jet stream would naturally consists of two parts: One is the time-invariant part and the other is the transient part (temporal variation of the adjustment). In conjunction with the observation, the time-mean adjustment is part of the climatological mean flow and hence is "invisible." The transient part of the adjustment is evidenced by the changes of the jet streams in terms of both location and intensity. In this study, we tend to relate the transient part of the adjustment of the jet stream to the maximum activity centers of low-frequency variability. The underlying mechanisms that are responsible for the temporal variation of the adjustment will be investigated. The time-mean adjustment will be also studied to better understand the temporal variation of the adjustment.

1718 (DOE/ER/61578–1, pp. 53-58) **Low-frequency anomalies in the NMC MRF model and reality.** Chen, W.Y. (Climate Analysis Center, Washington, DC (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

A low resolution version (Triangular 40) of the National Meteorological Center medium range forecast (MRF) model was employed to obtain simulated meteorological data for 10 continuous years. The wintertime Z500 fields were analyzed for its capability to generate persistent short-term climate anomalies. An 11-day running mean temporal filter was applied to obtain the low frequency components of its variability.

1719 (DOE/ER/61578–1, pp. 59-65) **Synoptic scale eddies in the Northern Hemisphere summer: A POP analysis.** Fyfe, J. (Canadian Climate Centre, Downsview, Ontario (Canada)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

This abstract summarizes some recent comparisons between observed and simulated summertime (JJA) band pass filtered (2-10 day) eddies in the Atlantic region. Our main diagnostic tool is the Principal Oscillation Pattern (POP) technique.

1720 (DOE/ER/61578–1, pp. 66-70) **Hydrologic and radiative feedbacks on extratropical transient eddies: Implications of global warming.** Gutowski, W.J. Jr. (Iowa State Univ., Ames, IA (United States)); Branscome, L.E. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. Grant ATM-8815290; Grant ATM-9123552; Grant ATM-9213852; Grant N (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Atmospheric transient eddies contribute significantly to global energy and water cycles through their transports of sensible heat and water vapor. Changes in global climate induced by greenhouse enhancement will likely alter transient eddy behavior. General circulation models (GCMs) can simulate such alterations, but unraveling all the feedbacks that occur in GCMs is difficult.

1721 (DOE/ER/61578–1, pp. 71-83) **Transient and stationary eddies in differing GCM climates.** Hall, N.M.J. (Univ. of Reading (United Kingdom)); Valdes, P.J. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The response of transients to changing forcing/boundary conditions can be just as striking as the response of mean fields such as surface temperature. Indeed the two are intimately linked and the extent to which the transients are either controlled by, or shape

the mean flow is difficult to quantify. Diagnostics are presented from several GCM equilibrium climate simulations using the UGAMP GCM. These include representations of the present climate: The Last Glacial Maximum and the Jurassic climate (150 M years ago). Changes in the distribution of transient eddy activity are compared with changes in low level baroclinicity to assess the direct response of the storm tracks to local conditions. Budget calculations are also presented to identify the changing roles of different components of the atmospheric circulation in transporting heat and moisture from equator to pole.

1722 (DOE/ER/61578–1, pp. 84-89) **Transient eddies and low frequency variability in the Northern Hemisphere winter climates of two GCMs.** Hansen, T. (Augsburg College, Minneapolis, MN (United States)); Sutera, A. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

An aspect of the climate change problem that is also important to our understanding of the general circulation is the relative roles and interactions between baroclinic-scale transient eddies and the larger scale, lower frequency variability of the flow in midlatitudes. A question may be raised as to how a reduced (or enhanced) level of high-frequency transient eddy activity may influence the character of the large-scale flow. If the transient eddies play an important role in determining the large-scale flow patterns in the atmosphere, then we might expect a profound impact from a changed level of high frequency transient eddy activity on the large-scale flow. An opportunity to address this question is presented by the intercomparison of two general circulation models, the differences in whose formulations lie primarily in their physical parameterizations.

1723 (DOE/ER/61578–1, pp. 90-95) **Stochastic excitation of low frequency variability in the midlatitude atmosphere.** Ioannou, P.J. (Massachusetts Institute of Technology, Cambridge, MA (United States)); Farrell, B.F. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. Grant ATM-9216189; Grant ATM-9216813. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Spectral analysis of the transient geopotential variance of the midlatitude atmosphere reveals a sharp peak in the wavenumber-period spectra concentrated at large scales (zonal wave numbers $m < 6$) and low-frequencies (periods $T > 10$ days). This is surprising because conventional baroclinic instability calculations predict a broad maximum of the variance at synoptic scale ($8 < m < 12$) with associated period of a few days. In this work we review the method for calculating the maintained variance and associated fluxes and then discuss some results pertaining to the interpretation of the EOF's which arise from the stochastic dynamics of non-normal dynamical systems.

1724 (DOE/ER/61578–1, pp. 96-103) **Northern hemispheric response to large volcanic eruptions in relation to El Nino - winter case studies.** Kirchner, I. (Max-Planck-Institut Hamburg (Germany)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

A large part of the global climate variability is attributed to variations of the Indian Monsoon and of El Nino/Southern Oscillation. Facing the recent violent volcanic eruption of Mount Pinatubo in June 1991, and searching for the climate signal of the increased greenhouse effect, the climate impact of volcanic aerosols becomes more and more interesting.

1725 (DOE/ER/61578–1, pp. 104-112) **Potential vorticity dynamics in the Canadian Climate Centre GCM.** Koshyk, J.N. (Canadian Climate Centre, Downsview, Ontario (Canada)); McFarlane, N. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The global distribution of Ertel potential vorticity (PV), simulated by the Canadian Climate Centre general circulation model (CCC GCM) is examined. An expression for PV in terms of an arbitrary vertical coordinate is formulated. This expression is used to calculate temporally averaged PV from the model temperature and wind fields. It is shown that a good approximation to the temporally averaged PV can be obtained from temporally averaged temperature and wind fields. An equation governing the time evolution of PV in the model vertical coordinate system is also derived. This equation is written in flux form and the associated flux is examined in a lower stratographic region of enhanced gravity-wave drag, above the Tibetan plateau. In this region, the southward transport of PV effected by gravity-wave drag is balanced to a large degree by the advection of PV northward. Finally, results from a recent experimental version of the CCC GCM, with an uppermost level at 1 mb, are used to examine PV dynamics associated with a spontaneous model stratospheric sudden warming. The warming is preceded by 2 successive large amplitude wavenumber 1 disturbances in the lower stratosphere. The second of these leads to splitting of the mid-stratospheric vortex into a double vortex pattern, as is clearly evident on maps of the 850K PV field during the warming period.

1726 (DOE/ER/61578–1, pp. 119-124) **Climatological features of blocking anticyclones.** Lupo, A.R. (Purdue Univ., West Lafayette, IN (United States)); Smith, P.J.; Oglesby, R.J. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Several climatological studies have been previously performed using large observational data sets (i.e., 10 years or longer) in order to determine the predominant characteristics of blocking anticyclones, including favored development regions, duration, preferred seasonal occurrence, and frequency of occurrence. These studies have shown that blocking anticyclones occur most frequently from October to April over the eastern Atlantic and Pacific oceans downstream from both the North American and Asian continental regions and the storm track regions to the east of these continents. Some studies have also revealed the presence of a third region block formation in western Russia near 40°E which is associated with another storm track region over the Mediterranean and western Asia.

1727 (DOE/ER/61578–1, pp. 125-130) **Potential vorticity dynamics for global scale circulations.** Lu, C. (Colorado State Univ., Fort Collins, CO (United States)); Schubert, W. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

One of the most notable advances in extratropical dynamics this decade has been the understanding of large-scale atmospheric and oceanic processes by using potential vorticity dynamics, the so called "IPV thinking." This analysis method has also been successfully extended to some tropical atmospheric circulation systems such as hurricanes and the Hadley circulation. The fundamental idea behind such a dynamic system rests with the fact that PV is a tracer-like quantity since it is conserved (in the absence of friction and diabatic heating) following a fluid particle and carries both significant dynamic and thermodynamic information regarding fluid motion. Thus, the prediction and inversion of PV form the most succinct dynamic view of atmospheric and oceanic motions. Furthermore, PV dynamics provides access to many insightful dynamic analyses such as: Propagation of Rossby waves, barotropic and baroclinic instabilities for shear flows, and wave-mean flow interactions. All these features make IPV analysis a very attractive tool for studying geophysical fluid systems.

1728 (DOE/ER/61578–1, pp. 131-138) **Wave-mean flow interaction and the baroclinic adjustment hypothesis.** MacKay, M.D. (Univ. of Toronto, Ontario (Canada)); Moore, G.W.K. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic

Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

It has been hypothesized that baroclinic waves interact with the zonally averaged flow in such a way as to eliminate the baroclinicity of the zone and thus the source of instability. In the context of quasigeostrophic theory this amounts to the elimination the pseudopotential vorticity gradient $\bar{Q}_y$ via adjustments in the vertical shear, the static stability, or both. Strictly speaking baroclinic neutralization can occur simply by eliminating the temperature gradient at the ground. Gutowski, however, shows that the minimal (i.e., with respect to changes in the zonal available potential energy) adjustment required to stabilize the flow is that where $\bar{Q}_y$ vanishes at the surface and in a finite layer above the surface. This is the baroclinic adjustment hypothesis.

1729 (DOE/ER/61578–1, pp. 139-147) **On the intra-seasonal variability within the extratropics in a general circulation model and observational data.** May, W. (Max-Planck-Institute for Meteorology, Hamburg (Germany)); Bengtsson, L. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

There are various phenomena on different spatial and temporal scales contributing to the intra-seasonal variability within the extratropics. One may notice higher-frequency baroclinic disturbances affecting the day-to-day variability of the atmosphere. But one finds also low-frequency fluctuations on a typical time scale of a few weeks. Blocking anticyclones are probably the most prominent example of such features. These fluctuations on different scales, however, are influencing each other, in particular the temporal evolution and spatial distribution. There has been observational work on various phenomena contributing to the intra-seasonal variability for a long time. In the last decade or so, however, with the increasing importance of General Circulation Models there have been some studies dealing with the intra-seasonal variability as simulated by these models.

1730 (DOE/ER/61578–1, pp. 148) **Fluctuations in the large-scale atmospheric circulation and ocean conditions associated with the dominant modes of wintertime precipitation variability for the contiguous United States.** Mitchell, T.P. (NASA/Goddard Space Flight Center, Greenbelt, MD (United States)); Blier, W. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The historical Climatic Division record of monthly- and seasonal-mean wintertime precipitation totals are analyzed to document the dominant patterns of precipitation variability for the contiguous United States. The analysis technique employed is the Rotated Principal Component analysis. Time series for the leading patterns are related to global sea-surface temperatures (SSTs), and to gridded surface and upper-air analyses for the Northern Hemisphere.

1731 (DOE/ER/61578–1, pp. 149-155) **On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic.** Peng, S. (McGill Univ., Montreal (Canada)); Mysak, L.A.; Derome, J.; Ritchie, H.; Dugas, B. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Using an atmospheric global spectral model at RPN with T42 horizontal resolution, we have shown that the winter atmosphere in the mid-latitude is capable of reacting to the SST anomalies prescribed in the northwest Atlantic with two different responses. The nature of the response is determined by the climatological conditions of the winter system. Experiments are conducted using either the perpetual November or January conditions, with or without the SST anomalies prescribed. Six 50-day integrations, with positive (or negative) SST anomalies prescribed, initialized from independent November analyses and similarly, four runs initialized from January analyses, have been examined in comparison with their control runs.

1732 (DOE/ER/61578–1, pp. 156-161) **Transient eddy feedback and low-frequency variability.** Robinson, W.A. (Univ. of Illinois, Urbana, IL (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. Grnat ATM-9222578; Grant ATM-9024832. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Superposed on any externally driven secular climatic change are fluctuations that arise from the internal nonlinear dynamics of the climate system. These internally generated variations may involve interactions between the atmosphere and the ocean, as in the case of El Nino, or they may arise from the dynamics of the atmosphere alone. Here we discuss the dynamics of interactions between transient eddies and lower-frequency motions in the atmosphere. The interactions between more transient and more persistent motions can be divided into two types. Nonlinear interactions among the transient motions can act as an essentially random source of low-frequency motion. The idea that the low-frequencies respond in a linear way to stochastic forcing from higher frequencies has been applied to the generation of planetary waves and to the forcing of changes in global angular momentum. In addition to stochastic coupling, there are systematic interactions, denoted feedbacks, through which the persistent motions modulate their own forcing by the transient eddies. This paper discusses the dynamics of these feedbacks.

1733 (DOE/ER/61578–1, pp. 162-168) **The importance of resolution on the response of mid-latitude transients to enhanced CO_2.** Senior, C.A. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The impact of global warming on the activity of the mid-latitude transients is not well understood. Work with simple models suggests that there will be two competing effects on transient activity. Firstly, there will be a reduction in the baroclinicity due to a smaller pole-equator temperature gradient and secondly there will be increased moisture availability in a warmer atmosphere. A comparison of the mid-latitude transients from two versions of the Hadley Centre for Climate Prediction and Research GCM run at different resolutions is presented and the importance of resolution on the simulation of the high and low frequency variability is discussed. At higher resolution, one of the largest responses of the model to a doubling of atmospheric CO_2 is an enhancement of the westerly flow in the North Atlantic, but this is much reduced at lower resolution. Consistency is sort between changes in the time mean flow and the transient behavior.

1734 (DOE/ER/61578–1, pp. 169-176) **Scaling of saturation amplitudes in baroclinic instability.** Shepherd, T.G. (Univ. of Toronto, Ontario (Canada)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

By using finite-amplitude conservation laws for pseudomomentum and pseudoenergy, rigorous upper bounds have been derived on the saturation amplitudes in baroclinic instability for layered and continuously-stratified quasi-geostrophic models. Bounds have been obtained for both the eddy energy and the eddy potential enstrophy. The bounds apply to conservative (inviscid, unforced) flow, as well as to forced-dissipative flow when the dissipation is proportional to the potential vorticity. This approach provides an efficient way of extracting an analytical estimate of the dynamical scalings

of the saturation amplitudes in terms of crucial non-dimensional parameters. A possible use is in constructing eddy parameterization schemes for zonally-averaged climate models. The scaling dependences are summarized, and compared with those derived from weakly-nonlinear theory and from baroclinic-adjustment estimates.

1735 (DOE/ER/61578–1, pp. 177-182) **Intraseasonal oscillations and their predictability in a hemispheric barotropic model with seasonal forcing.** Strong, C. (Univ. of California, Los Angeles, CA (United States)); Jin, F.; Ghil, M. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Intraseasonal oscillations with a period of 40-50 days were discovered in zonal winds over the tropical Pacific by Madden and Julian in the 1970s. Since that time, considerable modeling and observational literature on intraseasonal tropical variability has emerged. Links have been established between such fluctuations and those in global atmospheric angular momentum (AAM). This study sheds further light on the seasonal dependence of intraseasonal variability. Floquet theory is used to study the stability of the large-scale, midlatitude atmospheric system's periodic basic state.

1736 (DOE/ER/61578–1, pp. 183-192) **An EPV view of the zonal mean distribution of temperature and wind in the extratropical troposphere.** Sun, D.Z. (Princeton Univ., NJ (United States)); Lindzen, R.S. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The uniquely important role of Ertel potential vorticity (EPV) gradient along isentropes in the extra-tropical large scale flow has long been recognized and constantly emphasized. It has also been proposed that the EPV may be a powerful diagnostic tool for studying the general circulation on a global scale. However, it appears that no adequate effort has been made to examine temperature and wind distribution of the zonal mean flow as a function of EPV gradient along isentropes.

1737 (DOE/ER/61578–1, pp. 193-202) **Maintenance of extratropical low-frequency variabilities in the atmosphere.** Ting, M. (Univ. of Illinois, Urbana, IL (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

The extratropical low-frequency variability is one of the most important components in extratropical dynamics. While there are some understanding of the high-frequency, synoptic scale storm track eddy development due to baroclinic instability theory, its low-frequency counterpart is poorly understood and the theory for that is slowly evolving. The main difficulty seems to be lying on the fact that the problem is three dimensional in nature.

1738 (DOE/ER/61578–1, pp. 203-213) **Predictability of blocking.** Tosi, E. (Univ. of Bologna (Italy)); Ruti, P.; Tibaldi, S.; D'Andrea, F. McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change*. 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

Tibaldi and Molteni (1990, hereafter referred to as TM) had previously investigated operational blocking predictability by the ECMWF model and the possible relationships between model systematic error and blocking in the winter season of the Northern Hemisphere, using seven years of ECMWF operational archives of analyses and day 1 to 10 forecasts. They showed that fewer blocking episodes than in the real atmosphere were generally simulated by the model, and that this deficiency increased with increasing forecast time. As a consequence of this, a major contribution to the systematic error in the winter season was shown to derive from the inability of the model to properly forecast blocking. In this study, the analysis performed in TM for the first seven winter seasons of the ECMWF operational model is extended to the subsequent five winters, during which model development, reflecting both resolution increases and parametrisation modifications, continued unabated. In addition the objective blocking index developed by TM has been applied to the observed data to study the natural low frequency variability of blocking. The ability to simulate blocking of some climate models has also been tested.

1739 (DOE/EW/50011–T1) **Floor tile and mastic removal project report.** Corps of Engineers, Tulsa, OK (United States). Nov 1992. 266p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-90EW50011. Order Number DE95001219. Source: OSTI; NTIS; GPO Dep.

A test program was developed and coordinated with State and Federal Regulators and carried out at Fort Sill, Oklahoma. This program was carefully designed to create the worst conditions in order to evaluate whether asbestos fibers are released when asbestos containing floor tile and mastic are removed. There were over 1,000 samples taken and analyzed during the execution of the program. The conclusions reached were based upon analysis of the critical samples using the Transmission Electron Microscope (TEM) technology. Additionally, the TEM procedures were used to evaluate personnel samples to determine whether those fibers found were asbestos or other materials. Most of the (TEM) samples were analyzed by the US Environmental Protection Agency (EPA) Risk Reduction Engineering Laboratory in Cincinnati, Ohio.

1740 (DOE/HWP–160) **Navy radon assessment and mitigation program: Final report.** Oak Ridge National Lab., TN (United States). HAZWRAP Support Contractor Office. Oct 1994. 191p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Agreement 40-1791-86. Order Number DE95002970. Source: OSTI; NTIS; INIS; GPO Dep.

This final report encompasses the events from the beginning of the Navy Radon Assessment and Mitigation Program to the closure of the program on October 31, 1994. Included in the report are discussions of the phases of the program including screening, assessment, mitigation, and post-mitigation. The primary discussion involves screening and assessment. The report addresses recommendations made to the Naval Facilities Engineering Command by the Hazardous Waste Remedial Actions Program of Martin Marietta Energy Systems, Inc., and the final decisions that were made. Special emphasis is placed on quality assurance/quality control (QA/QC), since QA/QC was given top priority during the implementation of this program. Included in the discussion on QA/QC are ana overview of the measurement process, positive and negative controls, replicated measurements, and application of chamber exposures to data calibration. The report concludes with a discussion of testing considerations for naval facilities and radon mitigation considerations for the Department of the Navy.

1741 (ETDE/DE-mf–95715039) **Volatile halogenated hydrocarbons in the marine atmosphere: Concentrations, sources and mass budgets over North Sea and Baltic Sea.** Berichte aus dem Institut fuer Meereskunde an der Christian-Albrechts-Universitaet Kiel, v. 253. Quack, B. Institut fuer Meereskunde an der Univ. Kiel (Germany). May 1994. 252p. (In German). Order Number DE95715039. Source: OSTI; NTIS (US Sales Only).

Volatile halogenated hydrocarbons and other organic substances were determined in the marine boundary layer of the North Sea and the Baltic Sea. The preconcentration and analysis of the organic compounds were developed and optimized. The substances werde trapped on Tenax GR and Carbosieve SIII adsorption tubes. They were analysed by high resolution gas-chromatography on coupled capillary coloumns and a tandem detector, consisting of an electron-capture detector (ECD) and a flame-ionisation-detector (FID) after thermal desorption. It was possible to separate and detect more than 170 compounds, including bromo-, chloro- and iodo-C_1-C_6 hydrocarbons, several alkylnitrates and nonmethane hydrocarbons with concentrations in the ng-range. The concentrations of 18 chlorinated and brominated compounds were determined. Data were obtained from some 300 samples taken on several cruises and at different coastal sites. The distributions of the substances

were related to environmental parameters such as wind direction, air masses, atmospheric layer, windspeed, rain, seasonal and regional differences. More than 130 ECD-active substances were identified in the north-European marine atmosphere. They were grouped into anthropogenic, biogenic and atmospherically produced compounds, some of which have more than one source. (orig.)

1742 (ETDE/DE-mf–95716227) **Factors of influence relevant to ammonium release from liquid manure used as a basis for process-technical improvements.** Bayerisches Staatsministerium fuer Ernaehrung, Landwirtschaft und Forsten, Referat Landmaschinenwesen und Energiewirtschaft. Gelbe Hefte, v. 47. Gronauer, A. Technische Univ. Muenchen, Freising (Germany). Inst. fuer Landtechnik; Bayerisches Staatsministerium fuer Ernaehrung, Landwirtschaft und Forsten, Muenchen (Germany). Referat Landmaschinenwesen und Energiewirtschaft; Technische Univ. Muenchen, Freising (Germany). Fakultaet fuer Landwirtschaft und Gartenbau. Mar 1993. 160p. (In German). Order Number DE95716227. Source: OSTI; NTIS (US Sales Only).

The work aims to quantify the essential factors influencing the process of NH_3 release under controlled conditions and to investigate, in particular, the influence of the application technique on NH_3 losses during application. In the field, the influences of extremely different distribution devices (length of throw) and types of liquid manure (NH_3/NH_4^+ content, pH value) were studied. For the experiments identifying the factors of influence, an emission test stand was developed which permitted to vary weather and liquidity parameters under ceteris-paribus conditions. The reference liquid for liquid manure used in the pilot tests was NH_4Cl solution. The comparability with liquid manure was verified by means of filtered pig manure. (orig.)

1743 (ETDE/DE-mf–95716324) **The scavenging of atmospheric pollutants by clouds and precipitation by means of a vertical wind tunnel: Final report.** Pruppacher, H.R. Mainz Univ. (Germany). Inst. fuer Physik der Atmosphaere. [1991]. 10p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 0704580. Order Number DE95716324. Source: OSTI; NTIS (US Sales Only).

Our research carried out during 1988, 1989 and 1990 concerned itself with research on the scavenging of gaseous and particulate pollutants in the atmosphere by clouds and precipitation using for the first time a vertical wind tunnel as experimental tool. The results of the present research period has been recorded in form of 6 Diploma Thesis and published in form of 8 articles in scientific journals. The present experimental setup showed that the rate by which aerosol particles are taken up by freely falling drops is a strong function of the size of the aerosol particles and the drops. The uptake rate of SO_2 by freely falling drops is a strong function of the SO_2 concentration in the air, the size of the drops and the presence of H_2O_2 in air. For the first time it also could be shown quantitatively that snowflakes are actively involved in removing not only aerosol but also pollutant gases from the atmosphere. Calculations with our entraining air parcel model and our 2-dimensional cloud model for convective clouds showed that our wind tunnel data represent a significant input into such models. (orig.)

1744 (ETDE/DE-mf–95716329) **Forest pollution with airborne pollutants. Pollutant measurement. 5. report: Evaluation and presentation of airborne dust measurements in forest areas in Hessen.** Umweltplanung, Arbeits- und Umweltschutz, v. 118. Brandenburg, C. Fachhochschule Giessen-Friedberg, Giessen (Germany). Fachbereich Technisches Gesundheitswesen; Hessische Landesanstalt fuer Umwelt, Wiesbaden (Germany). Jan 1991. 240p. (In German). Order Number DE95716329. Source: OSTI; NTIS (US Sales Only).

The concentration and the inflow of immissions have been measured since 1983 at three stations and since 1985/86 at three other locations in forests. This is being done within the measurement program 'Immission-caused damage to forests'. At the forest-based stations, these immission measurements are carried out for a broad scale of components - sometimes in four different levels at one location. The diploma thesis is a documentation of the results of the measurements of dust carried out at the forest stations and focuses on the statements obtained from these data. Besides the standard evaluations for an extensive collection of data, dealing with the information revealed from the dust measurements leads to new ideas relating to various possibilities of evaluating. The fundamental statement saying that the sulphur concentration in the dust at the forest stations has dropped over the last years, could be stressed and demonstrated in a clean form. (orig./KW)

1745 (GKSS–94/E/8) **Support of the EMEP-project: European wide depositions of sulphur and nitrogen compounds as a consequence of sulphur, nitrogen oxides and ammonia emissions.** Krueger, O. (GKSS-Forschungszentrum Geesthacht GmbH (Germany). Inst. fuer Physik); Grassl, H. GKSS-Forschungszentrum Geesthacht GmbH (Germnay); Hamburg Univ. (Germany). Meteorologisches Inst. 1994. 186p. (In German). Sponsored by Bundesministerium fuer Umwelt, Naturschutz und Reaktorsicherheit, Bonn (Germany);Umweltbundesamt, Berlin (Germany). Contract UFOPLAN 10402637. (UBA-FB–94-104). Order Number DE95707482. Source: OSTI; NTIS (US Sales Only).

Also published as report UBA-FB–94-34.

For the European long range transport model EMEP the parametrisations of dry and wet deposition were improved. The dry deposition of sulphur and ammonia was improved in the source grid element with a high resolution Eulerian model. The wet deposition was improved over sea areas. With satellite measurements of the SSM/I it was demonstrated, that a detailled treatment of precipitation processes in the Norwegian weather forecast model LAM50 with a prognostic equation for the cloud water content, in contrast to the routine version, provides more realistic precipitation fields for air pollution modeling. The agreement between modelled and observed concentrations of sulphur and nitrogen compounds in air and precipitation is within a range of 40 to 70%. The project was carried out at the Meteorological Institute in Oslo and at the GKSS-Research Centre Geesthacht. (orig.)

1746 (GKSS–94/E/9) **Theoretical and experimental studies for the measurement of stratospheric aerosols and the influence of multiple backscattering on the cloud measurement with a polarization Raman lidar.** Wandinger, U. (GKSS-Forschungszentrum Geesthacht GmbH (Germany). Inst. fuer Physik). Hamburg Univ. (Germany). Fachbereich 12 - Physik; GKSS-Forschungszentrum Geesthacht GmbH (Germnay). 1994. 126p. (In German). Order Number DE95715240. Source: OSTI; NTIS (US Sales Only).

This dissertation describes the application of the Raman lidar technique to the measurement of stratospheric aerosol. It is shown from Mie scattering theory that aerosol mass and aerosol surface-area concentrations as well as the effective radius of the particle size distribution can be determined from the measured extinction and backscatter coefficient profiles. Measurements taken since the eruption of Mt. Pinatubo in June 1991 are shown. The measurement of tropospheric ice and water clouds is affected by multiple scattering. To quantify the corresponding uncertainty of the measured extinction and backscatter coefficients, a model based on radiative transfer calculations is used that deals with elastic-elastic and elastic-inelastic scattering processes. A double scattering model is developed for the computation of the depolarization properties of multiple scattering. Based on these numerical simulations the influence of multiple scattering on measurements taken with the polarization Raman lidar is discussed in detail. (orig.)

1747 (IC–94/141) **Atmospheric turbidity and the diffuse irradiance in Lagos, Nigeria.** Maduekwe, A.A.L. (Usmanu Danfodiyo Univ., Sokoto (Nigeria). Dept. of Physics); Chendo, M.A.C. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 25p. Order Number DE95606031. Source: OSTI; NTIS (US Sales Only); INIS.

The relationships between the total hemispherical irradiance reaching the earth surface in Lagos, Nigeria and the turbidity coefficients at two wavelengths namely $\lambda(500)$ and $\lambda(880)$ measured with a Volz sun photometer have been investigated. Using simple piecewise linear regression relationships between the atmospheric turbidity using Angstrom turbidity coefficients and the diffuse components of solar radiation are presented. (author). 18 refs, 11 figs, 3 tabs.

1748 (IC–94/167) **On the generation of coastal lows in central Chile.** Rutllant, J. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 20p. Order Number DE95606033. Source: OSTI; NTIS (US Sales Only); INIS.

Previous studies of the coastal-low occurrences in central Chile have been aimed at the formulation of a conceptual model to explain observed features in connection with applied studies. The most prominent weather pattern associated with CL occurrences, (type A), coincides with the onset of a warm, middle-troposphere ridge over central Chile, and a surface high over northern Argentina. The synoptic forcing of the low is related to weak frontal disturbances that travel equatorwards. They result in a thickening of the marine layer that becomes blocked by the coastal escarpment, at the time of the onset of the ridge aloft. The blocking of the stable air above the subsidence inversion by the Andes is also hypothesized. The analysis of the subsidence inversion, the geometry of the coastal and Andes mountain ranges, and a scale analysis of the non-dimensional governing equations for the generation of the coastal lows, following the approach of Reason and Steyn (1990); leads to the conclusion that both blocking actions are strong and persistent in central Chile. An interactive mechanism between the upper and lower blocking effects is postulated to explain the cyclonic vorticity and the initial steering of the coastal lows. The scale analysis of the governing equations for the propagation stage of the low suggests that, departing for the South African case, nonlinearity is important here, and that solitary Kelvin waves could be expected. Theoretical phase propagation speeds and Rossby radii are found to range between 8 and 15 m s-1 and 100-250 km, respectively. The importance of strong southerly winds ahead of the low and weak winds at its trailing edge is also stressed, as another major departure from the coastal-low behaviour elsewhere. (author). 17 refs, 4 figs, 4 tabs.

1749 (INEL/MISC–94045) **Results of monitoring for PCDDs and PCDFs in ambient air at McMurdo Station, Antarctica.** Lugar, R.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1993. 30p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001917. Source: OSTI; NTIS; GPO Dep.

This report presents the results of ambient air monitoring for polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) performed during the 1992-1993 austral summer in the vicinity of McMurdo Station, Antarctica. Fifteen air samples were collected from four different locations for determination of the presence and concentration of PCDD/PCDF compounds. General Metal Works Inc. PS-1 air samplers equipped with polyurethane foam (PUF) with a sample flow rate of approximately 0.27 m^3/min. were used to collect air samples. Sampling site selection, sampling procedures, and quality assurance procedures used were consistent with U.S. Environmental Protection Agency guidance for local ambient air quality networks. PCDD/PCDF compounds were not detected at the predominantly upwind location and at a more remote site on Black Island. Trace levels of only a few PCDD/PCDF congeners were detected sporadically at a location approximately 500 meters downwind of the station. The most frequent, most varied, and highest levels of PCDDs/PCDFs were measured at a "downtown" location, where concentrations of total PCDDs ranged from 0.27 to 1.80 pg/m^3 and total PCDFs from less than 0.1 to 2.77 pg/m^3. Results from the remote Black Island site indicate that the background Antarctic air is still "free" of PCDD/PCDF compounds (not detectable at current method detection limits). The initial baseline effort demonstrated that site selection and sampling equipment performance were satisfactory, provided useful data for assessing the impact of McMurdo operations on the local ambient air quality, and provided baseline data for assessing the Antarctica continental air quality.

1750 (INEL/MISC–94046) **Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica.** Lugar, R.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1993. 20p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001918. Source: OSTI; NTIS; GPO Dep.

This report presents the results of ambient air monitoring of carbon monoxide (CO), sulfur dioxide (SO_2), nitric oxide (NO), nitrogen dioxide (NO_2), and total oxides of nitrogen (NO_x) performed during the final weeks of the 1992-1993 austral summer in the vicinity of McMurdo Station, Antarctica. Commercially available, high sensitivity ambient air gas analyzers were used to continuously measure gas concentrations at two locations over a two and a three week time period respectively. Sampling site selection, sampling procedures and quality assurance procedures used for this effort were consistent with U.S. Environmental Protection Agency guidelines for local ambient air quality networks. CO, SO_2, and NO_2 concentrations measured were below the associated U.S. National Ambient Air Quality Standards. Carbon monoxide levels measured at both locations were near or below the instrument detection limit of 0.1 part per million (ppm). Hourly average SO_2 concentrations ranged from below the detection limit of 1 part per billion (ppb) to a single maximum hourly average value of 60 ppb. Hourly average NO_2 concentrations ranged from below the detection limit of 1 ppb to a single maximum hourly average value of 26 ppb. The impact on local air quality of ships docked at an ice pier was observed and quantified. The initial baseline effort demonstrated that site selection and sampling equipment performance were satisfactory, and provided useful data for assessing the impact of McMurdo operations on the local ambient air quality.

1751 (INEL/MISC–94047) **Results of PM_{10} and TSP monitoring at McMurdo Station, Antarctica.** Lugar, R.M. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1993. 13p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001920. Source: OSTI; NTIS; GPO Dep.

This report presents the results of ambient air monitoring of particulate matter performed during the 1992-1993 austral summer in the vicinity of McMurdo Station, Antarctica. Thirty three 24-hour samples were collected from three locations for determination of the concentration of particulate matter less that 10 micrometers (PM_{10}), and seven samples collected for determination of total suspended particulate matter (TSP) concentration. Critical flow high volume air samplers with a sample flow rate of approximately 1.1 m^3/min. were used to collect the particulate matter on quartz fiber filters for subsequent gravimetric analysis. Sampling site selection, sampling procedures, and quality assurance procedures used were consistent with US Environmental Protection Agency guidance for local ambient air quality networks. Mean austral summer PM_{10} levels in the McMurdo locale were 3 $\mu g/m^3$ at the predominantly upwind location, 9 $\mu g/m^3$ at a location approximately 500 meters downwind of the station, and 16 $\mu g/m^3$ at a "downtown" location. All PM_{10} results were below the US National Ambient Air Quality Standard. TSP results at all locations were greater than PM_{10} concentrations; ranging from 8 $\mu g/m^3$ at the upwind location to a maximum measurement of 276 $\mu g/m^3$ at the "downtown" location. The initial baseline effort demonstrated that site selection and sampling equipment performance were satisfactory, and provided useful data for assessing the impact of McMurdo operations on the local ambient air quality.

1752 (INIS-mf–15055) **Causes of decadal climate variability over the North Pacific and North America.** Report - Max-Planck-Institut fuer Meteorologie, v. 141. Latif, M. (Max-Planck-Institut fuer Meteorologie, Hamburg (Germany)); Barnett, T.P. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Sep 1994. 25p. Order Number DE95715075. Source: OSTI; NTIS (US Sales Only); INIS.

The cause of decadal climate variability over the North Pacific and North America is investigated by analyzing data from a multi-decadal integration with a state of the art coupled ocean-atmosphere model and observations. About one third of the low-frequency climate variability in the region of interest can be attributed to a cycle involving unstable air-sea interactions between the subtropical gyre circulation in the North Pacific and the Aleutian low pressure system. The existence of this cycle provides a basis for long-range climate forecasting over the western United States at decadal time scales. (orig.)

1753 (INIS-mf–15056) **Will greenhouse gas-induced warming over the next 50 years lead to higher frequency and**

greater intensity of hurricanes?. Report - Max-Planck-Institut fuer Meteorologie, v. 139. Bengtsson, L.; Botzet, M.; Esch, M. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Aug 1994. 31p. Order Number DE95715050. Source: OSTI; NTIS (US Sales Only); INIS.

The use of a high resolution atmospheric model at T106 resolution, for studying the influence on greenhouse warming on tropical storm climatology, is investigated. The same method for identifying the storms has been used as in a previous study by Bengtsson et al (1994). The sea surface temperature anomalies have been taken from a previous climate change experiment, obtained with a low resolution ocean-atmosphere coupled model. The global distribution of the storms agree in their geographical position and seasonal variability with that of the present climate, but the number of storms is significantly reduced, particularly at the Southern hemisphere. The main reason to this is related to increased tropospheric stability, associated with increased warming at the upper troposphere and changes in the large scale circulation such as a weaker Hadley circulation and stronger upper air westerlies. The surface winds in the tropics are generally weaker and evaporation is also somewhat reduced, in spite of higher sea surface temperatures. (orig.)

1754 (INIS-mf–15057) **Interactions of the tropical oceans.** Report - Max-Planck-Institut fuer Meteorologie, v. 140. Latif, M. (Max-Planck-Institut fuer Meteorologie, Hamburg (Germany)); Barnett, T.P. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Sep 1994. 49p. Order Number DE95715049. Source: OSTI; NTIS (US Sales Only); INIS.

We have investigated the interactions of the tropical oceans on interannual time scales by conducting a series of uncoupled atmospheric and oceanic general circulation experiments and hybrid coupled model simulations. Our results illustrate the key role of the El Nino/Southern Oscillation (ENSO) phenomenon in generating interannual variability in all three tropical ocean basins. Sea surface temperature (SST) anomalies in the tropical Pacific force via a changed atmospheric circulation SST anomalies of the same sign in the Indian Ocean and SST anomalies of the opposite sign in the Atlantic. However, although air-sea interactions in the Indian and Atlantic Oceans are much weaker than those in the Pacific, they contribute significantly to the variability in these two regions. The role of these air-sea interactions is mainly that of an amplifyer by which the ENSO induced signals are enhanced in ocean and atmosphere. This process is particularly important in the tropical Atlantic region. We investigated also whether ENSO is part of a zonally propagating "wave" which travels around the globe with a time scale of several years. Consistent with observations, the upper ocean heat content in the various numerical simulations seems to propagate slowly around the globe. SST anomalies in the Pacific Ocean introduce a global atmospheric response which in turn forces variations in the other tropical oceans. Since the different oceans exhibit different response characteristics to low-frequency wind changes, the individual tropical ocean responses can add up coincidentally to look like a global wave, and that appears to be the situation. In particular, no evidence is found that the Indian Ocean can significantly affect the ENSO cycle in the Pacific. Finally, the potential for climate forecasts in the Indian and Atlantic Oceans appears to be enhanced if one includes, in a coupled way, remote influences from the Pacific. (orig.)

1755 (INIS-mf–15058) **Detecting anthropogenic climate change with an optimal fingerprint method.** Report - Max-Planck-Institut fuer Meteorologie, v. 142. Hegerl, G.C. (Max-Planck-Institut fuer Meteorologie, Hamburg (Germany)); Storch, H. von; Hasselmann, K.; Santer, B.D.; Cubasch, U. Max-Planck-Institut fuer Meteorologie, Hamburg (Germany). Sep 1994. 68p. Order Number DE95715074. Source: OSTI; NTIS (US Sales Only); INIS.

We propose a general fingerprint strategy to detect anthropogenic climate change and present application to near surface temperature trends. An expected time-space-variable pattern of anthropogenic climate change (the 'signal') is identified through application of an appropriate optimally matched space-time filter (the 'fingerprint') to the observations. The signal and the fingerprint are represented in a space with sufficient observed and simulated data. The signal pattern is derived from a model-generated prediction of anthropogenic climate change. Application of the fingerprint filter to the data yields a scalar detection variable. The statistically optimal fingerprint is obtained by weighting the model-predicted pattern towards low-noise directions. A combination of model output and observations is used to estimate the noise characteristics of the detection variable, arising from the natural variability of climate in the absence of external forcing. We test then the null hypothesis that the observed climate change is part of natural climate variability. We conclude that a statistically significant externally induced warming has been observed, with the caveat of a possibly inadequate estimate of the internal climate variability. In order to attribute this warming uniquely to anthropogenic greenhouse gas forcing, more information on the climate's response to other forcing mechanisms (e.g. changes in solar radiation, volcanic or anthropogenic aerosols) and their interaction is needed. (orig./KW)

1756 (INIS-mf–15065, pp. 165-205) **Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage.** Kley, D. (Forschungszentrum Juelich GmbH (Germany)); Geiss, H.; Heil, T.; Holzapfel, C. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

The concentrations of O_3, SO_2 and NO_2 in rural regions of the FRG for the time span from 1980 to 1988 are discussed in the context of forest damage. Main emphasis is given to ozone. The ozone hypothesis (ozone alone, or in conjunction with other factors such as climatic stress, is a dominating element in a causative chain of the syndrome of new forest damage) is checked to be consistent with available informations on forest damage and O_3 concentrations. The multi-year daytime average for the growing season is 38.9 ppb. In a statistical sense it is believed to establish a positive correlation between the level of forest damage and summertime ozone concentration. The statistical methods as well as the difficulties for evaluating the measuring data are discussed. The multi-year annual average of SO_2 concentration is 5.8 ppb. There is no evidence for the SO_2 concentration to decrease over the period from 1980 to 1987. The multi-year annual concentration levels of NO_2 are increasing over rural Germany. The increase amounts 1.6% per year, based on the 1980 average value of 4 ppb. (vhe)

1757 (INIS-mf–15065, pp. 207-254) **Temporal development of the pollution load of reactive trace gases in forested areas in the United States.** Mohnen, V.A. (State Univ. of New York, Albany, NY (United States)); Lefohn, A.S. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

An overview of holy US air quality trends from 1979 to 1987 is given. The emission trends of SO_2, O_3 and NO_x show some decline. The results of air quality assessment in the spruce fire growing range are presented for O_3, H_2O_2 and SO_2. A case study was performed to investigate the relationship between synoptic weather patterns and cloudwater ions and has phase pollutant concentrations. The results are discussed. (vhe)

1758 (INIS-mf–15065, pp. 257-267) **Rates of wet, moist and dry deposition in forests: measuring approaches and measuring results.** Hoefken, K.D. (GSF Muenchen, Projekttraeger Umwelt- und Klimaforschung (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH

(Germany). 1989. 575p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

For the valuation of the effect of trace substances from the atmosphere on forest it is not only important to know the cencentration. What matters is the flow of trace substances to the surfaces considered (leaves or soil) and their deposition. A distinction is made between wet, moist, and dry deposition. For the time being it is not yet possible to give a geographic distribution of the rates of wet, moist, and dry deposition as the different methods and collection devices are not truly comparable. (orig./vhe)

1759 (INIS-mf–15065, pp. 269-283) **Application of surface analysis methods to studies of atmospheric deposition in forests.** Lindberg, S.E. (Environmental Sciences Div., Oak Ridge National Lab., TN (United States)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Various surface analysis methods have been applied to the quantification of dry and total atmospheric deposition in recent years. Several of these methods have proved very useful in studies over large spatial and temporal scales, where application of atmospheric methods are limited. The methodology, asssumptions, and applications of some of these methods are reviewed here, and examples provided of recent results. Some of these methods can provide the field data necessary for (1) testing of regional deposition models, (2) development of process-level models of in-canopy dry deposition, and (3) comparison with results of applications of micrometeorological methods to deposition in complex terrain. These methods involve some assumptions which have not been rigorously tested and require further evaluation. (orig.)

1760 (Juel–2837) **Identification and analysis of data sources for data bases on greenhouse gas emissions in Germany not resulting from energy conversion processes: Study within IKARUS project, sub-project 9.** Internationale Treibhausgasverifikation, v. 7. Buchert, M.; Fritsche, U.; Matthes, F.C. Forschungszentrum Juelich GmbH (Germany). Programmgruppe Technologiefolgenforschung. Nov 1993. 79p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT ET 9188A. Order Number DE95711699. Source: OSTI; NTIS (US Sales Only).

The report analyzes the current state of knowledge in Germany on greenhouse gases not resulting from energy consumption. Relevant data sources are analyzed, and the genesis of the data is gone into. Industry, agriculture, forestry and the waste management industry are investigated as possible causes of greenhouse gas emissions. Apart from the gases with a direct greenhouse effect (CO_2, CH_4, N_2O), also gases with an indirect greenhouse effect (CO, NMVOC, NO_x, SO_2) are taken into account, as well as CFC and CH. The analysis shows that the Federal Environmental Office (UBA) is the only "relevant" data source currently available, as other data sources provide only unsystematic, erratic and incomprehensible data on greenhouse gases. (orig.)

1761 (KFK–5342) **Karlsruhe Nuclear Research Center, Institute for Meteorology and Climate Research. Progress report on research and development work in 1993.** Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Meteorologie und Klimaforschung. Mar 1994. 29p. (In German). Order Number DE95716089. Source: OSTI; NTIS (US Sales Only); INIS.

The Institute for Meteorology and Climate Research is operated by Karlsruhe Nuclear Research Centre in cooperation with Karlsruhe University. It investigates mesoscale and global atmospheric processes. Work on mesoscale processes focuses on interactions between atmosphere, soil and vegetation via the exchange of momentum, energy, water, and materials. Another field of primary interest are the flow processes and turbulent exchange processes in the lower troposphere. Parallel to the experiments, numerical simulation models for describing and predicting mesospheric climate-relevant processes and atmospheric exchange processes were used and improved upon. For remote processing of atmospheric parameters, a satellite-based data processing system was used for recording land surface parameters and vertical profiles and meteorological variables that are applicable for climatological studies and for the validation of numerical models. For recording and interpretation of the spatial and time-dependent distribution of trace elements, measuring instruments in the field of air chemistry were newly developed or improved upon, especially with a view towards high time resolution of the measured data. Ozone research is a key issue of the remote measurements. Contributions were made primarily in the framework of international research programmes (e.g. EASOE) on the degradation of the atmospheric ozone layer in the higher latitudes of the northern hemisphere. In addition to the experimental investigations, the transport of stratospheric trace elements was simulated numerically. (orig./KW)

1762 (KFK-PEF–123) **Improvement of a wet process for the separation of aerosols.** Schenkel, A. (GEA Wiegand GmbH und Co., Karlsruhe (Germany). Abt. Forschung und Entwicklung); Koch, A. Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung (PEF). Jul 1994. 123p. (In German). Sponsored by Land Baden-Wuerttemberg, Stuttgart (Germany);Commission of the European Communities, Brussels (Belgium). Contract 391002. Order Number DE95707509. Source: OSTI; NTIS (US Sales Only).

The tried and tested nozzle scrubber with high pressure nozzles is an interesting wet scrubber which is not only suited as a retrofitted equipment for existing wet scrubbers. On the basis of parameter studies and measures carried out at realized industrial aerosol separators it was possible to clarify the main effective mechanisms and the influence of essential design parameter on the enlargement of aerosols and the separation of aerosols. Any condensation of particulates being insoluble in water and non-hygroscopic will take place when high pressure nozzle systems and 2-phase-nozzle systems are applied as here oversaturations are too small. For hygroscopic particulates condensation is of great significance because in an upstream gas saturation zone these aerosols can be enlarged in a relatively cost-saving way and thus be removed. Main separating mechanisms are mass inertial separation and to a lesser extent the turbulence-induced inertial separation. The contribution of the turbulence-induced inertial separation is less than at first anticipated. Energetically high-pressure-nozzles are significantly more favourable than 2-phase-nozzles. Therefore, these types should be preferred. Owing to described design criteria it is possible to design an aerosol separator that is optimal with regard to the specific energy-input, whose expenditure of energy is noticeably below the conventional wet separator. Furthermore the interesting aspect of the particle growth of technical aerosols upstream and within an absorber as well as the wet separator has been considered which until now had not been examined under these conditions. (orig./HP)

1763 (LA–12636) **Evaluation of no-clean solder process designed to eliminate the use of ozone-depleting chemicals.** Paffett, M.T.; Farr, J.D.; Rogers, Y.C.; Hutchinson, W.B. Los Alamos National Lab., NM (United States). Oct 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002140. Source: OSTI; NTIS; GPO Dep.

This paper summarizes the LANL contributions to a joint Motorola/SNLA/LANL cooperative research and development agreement study on the reliability of an alternative solder process that is intended to reduce or eliminate the use of ozone-depleting chemicals in the manufacture of printed wire boards (PWBs). This process is termed self-cleaning because of the nature of the thermal chemistry associated with the adipic and formic acid components used in place of traditional solder rosin fluxes. Traditional rosin fluxes used in military electronic hardware applications are

cleaned (by requirement) using chlorofluorohydrocarbons. The LANL contribution centers around analytical determination of PWB cleanliness after soldering using the self-cleaning method. Results of these analytical determinations involving primarily surface analysis of boards following temperature, temperature and humidity, and long-term storage testing are described with representative data. It is concluded that the self-cleaning process leaves behind levels of solid residue that are visually and analytically observable using most of these surface analysis techniques. The materials compatibility of electronic components soldered using the self-cleaning soldering process is more fully described in the project report issued by SNLA that encompasses the complete project with statistical lifetime and accelerated aging studies. Analytical surface specificity and suggestions for further work are also given.

1764 (LA-SUB–94-140) **Large eddy simultations of the atmospheric boundary layer east of the Colorado Rockies.** Costigan, K.R.; Cotton, W.R. Los Alamos National Lab., NM (United States); Colorado State Univ., Fort Collins, CO (United States). Dept. of Atmospheric Science. 22 Oct 1992. 140p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001748. Source: OSTI; NTIS; GPO Dep.

Atmospheric Science Paper No. 511.

Large eddy simulation, LES, has often been carried out for the idealized situation of a simple convective boundary layer. Studies of dual Doppler radar and aircraft data from the Phoenix II experiment indicate that the boundary layer of the Colorado High Plains is not a purely convective boundary layer and it is influenced by the mountains to the west. The purpose of this study is to investigate the atmospheric boundary layer on one particular day on the Colorado High Plains. This research applies a LES nested within larger grids, which contain realistic topography and can simulate the larger-scale circulations initiated by the presence of the mountain barrier. How and to what extent the atmospheric boundary layer of the Colorado High Plains is influenced by larger scale circulations and other phenomena associated with the mountain barrier to the west is investigated. The nested grid LES reproduces the characteristics of the atmosphere for the case study day reasonably well. The mountains influence the atmospheric boundary layer over the plains to the east in several ways. The mountains contribute to the vertical shear of the horizontal winds through the thermally-induced mountain-plains circulation. As a consequence of the wind shear, the boundary layer that develops over the mountains is advected eastward over the top of the plains boundary layer, which is developing separately. This layer is marked by a mixture of gravity waves and turbulence and is atypical of a purely convective boundary layer. Just below this layer, the capping inversion of the plains boundary layer is weak and poorly defined compared to the inversions capping purely convective boundary layers. Gravity waves, triggered by the obstacle of the Rocky Mountains and by convection in the mountain boundary layer, also influence the atmosphere above the Colorado High Plains. These influences are found to have significant effects on the turbulence statistics and the energy spectra.

1765 (LA-UR–94-3132) **Continuously-tunable, narrow-linewidth, Q-switched Cr:LiSAF laser for lidar applications.** Shimada, Tsutomu; Early, J.W.; Lester, C.S.; Quick, C.R.; Tiee, J.J.; Cockroft, N.J. Los Alamos National Lab., NM (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950101–1: Advanced solid-state laser conference, Memphis, TN (United States), 29 Jan - 1 feb 1995). Order Number DE95000862. Source: OSTI; NTIS; GPO Dep.

A continuously-tunable, narrow-linewidth, flashlamp-pumped, Q-switched Cr:LiSAF laser has been developed (energy: 30 mJ, pulsewidth: 40 ns, linewidth: <2 GHz) and was used successfully for the DIAL (differential absorption lidar) measurements of atmospheric water vapor.

1766 (LA-UR–94-3399) **Development of methods for evaluating options for improving the air quality in Santiago, Chile and its environs.** Williams, M.D.; Brown, M.J. Los Alamos National Lab., NM (United States). Oct 1994. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002700. Source: OSTI; NTIS; GPO Dep.

Officials from both the Santiago metropolitan air quality commission (La Comision Especial de Descontaminacion de le Region Metropolitana) and a government-owned copper development company (La Empresa Nacional de Mineria (ENAMI)) have asked assistance to deal with the air quality problems in Santiago and associated with smelter emissions. Two smelter sites are examined. One smelter, Ventanas, is located on the Pacific coast to the northwest of Santiago, while the other, Paipote, is located several hundred kilometers to the north. The Ventanas emissions may potentially affect Santiago air quality. Several advantages of working with the smelters in the early phases of the project are: (1) the meteorological and air quality monitoring in the vicinity of the smelters allows for model validation; (2) the development of a useful emission inventory is easier, (3) the smelters pose a simpler problem, which when resolved, will provide an early benefit to our Chilean colleagues, and (4) important experience is gained in preparation to delve deeper into Santiago's air pollution problems. Our goals for this phase of the project include: determining the smelters impact on air quality in surrounding communities; evaluating whether air pollution from the smelters reaches Santiago; and helping Chilean scientists meet a national decree to have air quality models for smelters.

1767 (LA-UR–94-3674) **New technique for determining boundary dose from the Los Alamos Meson Physics Facility.** Staley, H.C.; Waechter, D.A. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-941061–7: Nuclear science symposium: medical imaging conference, Norfolk, VA (United States), 30 Oct - 5 nov 1994). Order Number DE95002813. Source: OSTI; NTIS; INIS; GPO Dep.

The boundary dose measurement system described here is designed to determine, in real time, the radiation dose resulting from operations at Los Alamos National Laboratory's Meson Physics Facility, LAMPF. Dose at the Laboratory boundary is currently determined through computer modelling, using measurements made at the point of emission. The current model, however, may not account for variations in wind patterns that could affect the LAMPF plume as it moves toward the boundary, 700m or more from the point of origin. Such variations are the result of the local topography. The LAMPF measurement system is intended to correct for these possible variations, refining dose estimates through actual measurements made near the site boundary.

1768 (NEI-DK–1646) **Air quality in the metropolitan area 1992-93.** Hovedstadsregionens Luftovervaagningsenhed, Copenhagen (Denmark). 1994. 47p. (In Danish). Order Number DE95707286. Source: OSTI; NTIS.

Levels of air pollution in the Copenhagen (DK) area, monitored during 1992-1993, are described and presented. It is stated that levels are similar to those measured during 1991. Pollution is concentrated in regions surrounding the town measuring stations though the concentration of ozone is highest at stations located in the periphery. Concentrations of sulphur dioxide are under the advised limits at all stations. Nitrogen dioxide amounts fell within the Danish limits but the advised Danish 50% quantile limits were exceeded in a number of areas. The lowest concentrations of ozone were measured in the heavily trafficated streets of Copenhagen where the level of nitrogen monoxide is high because of the presence of exhaust gases. Levels of carbon monoxide were generally lower than those recommended by the World Health Organization (WHO). In 4 regions (H.C.Andersens Boulevard 25, Glostrup and Herlev) the 8-hour limit was exceeded. Soot concentrations were highest during the winter and were similar to 1991 levels. Floating dust concentrations, mostly consisting of soil dusts, were lower than Danish set limits. Dusts were also investigated, using the PIXE method of analysis, for chemical contents. The amount of lead pollution was found to be similar to that measured in 1991. Efforts are now being made to locate sources of air pollution based on measurement of concentrations of chemicals in dusts coordinated with wind directions. Detailed data on monitoring results are presented. (AB)

1769 (NEI-NO–430) **Investigations of radon indoors and on building sites: Radiation protection - Booklet 3.** Kolstad, A.K.; Strand, T. Statens Straalevern, Oesteraas (Norway). Aug 1994. 20p. (In Norwegian). Order Number DE95606036. Source: OSTI; NTIS; INIS.

In the booklet different methods for the measurement of indoor radon concentration is described, evaluated and classified. An evaluation of radon measuring methods used in building site investigations is also given. 1 ref., 2 figs., 5 tabs.

1770 (UCRL-ID–118059) **Effects of tropospheric aerosols on radiative flux calculations at UV and visible wavelengths.** Grossman, A.S.; Grant, K.E. Lawrence Livermore National Lab., CA (United States). Aug 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95002596. Source: OSTI; NTIS; INIS; GPO Dep.

The surface fluxes in the wavelength range 175 to 735nm have been calculated for an atmosphere which contains a uniformly mixed aerosol layer of thickness 1km at the earth's surface. Two different aerosol types were considered, a rural aerosol, and an urban aerosol. The visibility range for the aerosol layers was 95 to 15 km. Surface flux ratios (15km/95km) were in agreement with previously published results for the rural aerosol layer to within about 2%. The surface flux ratios vary from 7 to 14% for the rural aerosol layer and from 13 to 23% for the urban aerosol layer over the wavelength range. A tropospheric radiative forcing of about 1.3% of the total tropospheric flux was determined for the 95km to 15km visibility change in the rural aerosol layer, indicating the potential of tropospheric feedback effects on the surface flux changes. This effect was found to be negligible for the urban aerosol layer. Stratospheric layer heating rate changes due to visibility changes in either the rural or urban aerosol layer were found to be negligible.

1771 (WHC-SD-L070-PMP–001) **Project L-070, "300 Area process sewer piping system upgrade" Project Management Plan.** Wellsfry, H.E. Westinghouse Hanford Co., Richland, WA (United States). 16 Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001040. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the project management plan for Project L-070, 300 Area process sewer system upgrades.

1772 (WSRC-TR–94-0468) **The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity.** Fast, J.D. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Sep 1994. 143p. Sponsored by USDOE, Washington, DC (United States);Department of Agriculture, Washington, DC (United States). DOE Contract AC09-89SR18035. Agreement NC-93-2. Order Number DE95002682. Source: OSTI; NTIS; GPO Dep.

This study employs a three-dimensional, nonhydrostatic mesoscale model to evaluate the effects of horizontally heterogeneous soil moisture and vegetation type on the atmosphere during two periods in which wildland fires occurred. Numerical sensitivity simulations demonstrate that evapotranspiration significantly affects the boundary-layer structure embedded in the synoptic-scale circulations. In regions with sufficiently moist soils, evapotranspiration increases the humidity and modifies the diurnally varying temperature near the surface. Occasionally, changes in the humidity and temperature fields can also be seen a significant distance downwind of the moist soil regions. The perturbations in the temperature fields ultimately affect the wind speed and direction over or at the boundaries of the moist-soil regions, but only at certain times during the simulation period. The higher humidity also increases the cloudiness and changes the precipitation amounts, indicating that soil moisture and vegetation may play an important role in modifying the spatial distribution and intensity of precipitation. A lower atmospheric stability index, that is an indicator of the potential for wildland fire, is also calculated from the model results. This index is also sensitive to the horizontal distribution of soil moisture and vegetation, especially in regions with relatively moist soils. While only two periods are examined in this study, the impact of surface inhomogeneities in soil moisture and vegetation type on the atmosphere is expected to be highly dependent on the particular synoptic conditions and upon the distribution of soil moisture.

5402 Environmental Sciences, Terrestrial

Refer also to citation(s) 105, 139, 149, 223, 224, 227, 228, 232, 241, 248, 253, 266, 270, 271, 288, 289, 294, 307, 315, 319, 320, 339, 340, 344, 349, 364, 432, 433, 434, 439, 440, 441, 442, 443, 451, 453, 455, 458, 460, 461, 462, 463, 464, 465, 466, 468, 473, 474, 475, 476, 477, 488, 489, 493, 495, 499, 501, 505, 509, 579, 587, 623, 695, 715, 735, 764, 922, 1041, 1051, 1054, 1312, 1440, 1495, 1496, 1598, 1665, 1685, 1690, 1691, 1715, 1845, 1849, 1850, 1853, 1870, 1884, 1950, 1951, 1952, 1953, 1957, 1958, 1959

1773 (ANL/EA/CP–84264) **In situ analysis of soil at an open burning/open detonation disposal facility: J-Field, Aberdeen Proving Ground, Maryland.** Martino, L. (Argonne National Lab., Washington, DC (United States)); Cho, E.; Wrobel, J. Argonne National Lab., IL (United States). [1994]. 30p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410230–1: 9. annual conference on contaminated soils, analysis, fate, environmental and public health effects, remediation and regulation, Amherst, MD (United States), 17-20 Oct 1994). Order Number DE95001444. Source: OSTI; NTIS; INIS; GPO Dep.

Investigators have used a field-portable X-Ray Fluorescence (XRF) Analyzer to screen soils for a suite of metals indicative of the open burning and open detonation (OB/OD) activities that occurred at the J-Field site at Aberdeen Proving Ground, Maryland. The field XRF results were incorporated into a multiphase investigation of contaminants at the Toxic Burning Pits Area of Concern at J-Field. The authors determined that the field-portable XRF unit used for the study and the general concept of field XRF screening are invaluable tools for investigating an OB/OD site where intrusive sampling techniques could present unacceptable hazards to site workers.

1774 (CEA-CONF–11814) **Elementary migration around the Oklo nuclear reactors. Implications for high level radioactive wastes storage.** Menet-Dressayre, C.; Menager, M.T. CEA Centre d'Etudes de la Vallee du Rhone, 30 - Marcoule (France). Dept. d'Exploitation du Retraitement et de Demantelement. 1993. 10p. (In French). (CONF-9310378–: Oklo Working Group Meeting, Bruxelles (Belgium), 11-12 Oct 1993). Order Number DE95605958. Source: OSTI; NTIS (US Sales Only); INIS.

The study of Uranium and rare earths near the reactors has displayed the radioelements transfer in the reactors neighbourhood. The main implications for high level radioactive wastes disposal in geological formations are discussed. 12 refs.

1775 (CONF-9108101–4) **Trends and implications of biological analyses for agricultural operations.** Ash, D.H.; Salladay, D.G. National Fertilizer and Environmental Research Center, Muscle Shoals, AL (United States). [1994]. 12p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (CONF-930802–20: 4. chemical congress of North America; 206. American Chemical Society (ACS) national meeting, New York, NY (United States); Chicago, IL (United States), 25-30 Aug 1991; 22-27 aug 1993; Z–342). Order Number DE95001732. Source: OSTI; NTIS.

State and federal legislatures, regulatory agencies, the agricultural community, and the public at large have increasing concerns about groundwater contamination and other environmental issues. The U.S. Congress has requested all federal agencies working with agriculture to address these issues. Even with current pressures to "cut government spending," public pressure prevails to clean up polluted sites and to prevent future contamination. Farmers, agrichemical dealers and producers, and related trade associations have voiced concern about regulations affecting their industries. Over the last three decades positive changes have evolved in the disposal or final resolution of agricultural wastes from indiscriminate disposal on land and in water, through regulated land filling and incineration to a point where biological treatment/remediation strategies are coming to the forefront. These biological strategies bring with them different requirements for analytical methods. In March of this year the Environmental Protection Agency (EPA) and ARA organized a work group which met in Cincinnati, Ohio, to discuss the bioremediation of pesticide-laden soil. This work group consisted of EPA researchers, regulators, and administrators; state ag-environmental technologists and program directors; ag-chemical

producer, remediation program managers, university ag researchers, USDA researchers, and TVA technologists. Consensus was quickly obtained on the utter unaffordability of current chemical and thermal treatment schemes for agricultural wastes, contaminated soils, and rinsewaters. Consensus was also reached that conventional analytical methods are too expensive and complicated for use in the field demonstration/application of the bioremediation-type processes. Thus the group recommended and supported field agrichemical dealer demonstrations of landfarming and composting with an emphasis on the need to develop low cost, easy toxicological measurements.

1776 (CONF-9205419–1) **U.S. fertilizer industry and the environment - from mine to farm.** Shields, J.T. Tennessee Valley Authority, Muscle Shoals, AL (United States). [1994]. 10p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–340). From 60. IFA annual conference; Seoul (Korea, Republic of); 25-29 May 1992. Order Number DE95001734. Source: OSTI; NTIS.

This article looks at the US fertilizer industry covering the following topics: phosphate mining, basic integrated production, retail dealers, and farm practices. At each point the impact of environmental concerns and compliance on the fertilizer industry is discussed.

1777 (CONF-9303310–1) **The potential of PCB photochemistry at Moccasin Bend.** Hinton, M.M.; Beck, M.J. Tennessee Valley Authority, Muscle Shoals, AL (United States). 30 Mar 1993. 15p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (Z–353). From EPRI PCB biotransformation project collaborators meeting; Chattanooga, TN (United States); 30 Mar 1993. Order Number DE95001730. Source: OSTI; NTIS.

The TVA/EPRI Tailored Collaborative Project "Biotransformation of Polychlorinated Biphenyls (PCBS) in Contaminated Soils", has as its objective biotransformation of PCB contaminated soils at utility sites (Phase I Report March 1992). However, there is recognition of the existence of other types of nonmetabolic alterations of PCBs in the contaminated soils. Of these nonmetabolic alterations, photoalteration is of special interest to the project. Photoalteration has the potential for enhancing PCB transformation with little intervention and little harm to the microbial community. PCBs have pervaded the environment, and the paucity of knowledge about their chemistry is becoming readily apparent. Although PCBs are quite resistant to degradation, photolysis, which is a chemical decomposition process that is induced by radiant energy, may be important in the environmental chemistry of PCBS. The photochemical degradation of PCBs may affect atmospheric levels of contaminants and photolabile chemicals that reside in water bodies or on surfaces, as for example, on leaves and vegetation. Chemicals present in the environment can undergo direct or indirect phototransformation which includes photosensitized degradation and oxygenation as well as photoinduced degradation. Photoalteration is produced by either artificial light or by light from the sun. Ultraviolet radiation (UV) is known to induce chemical reactions in many chlorinated hydrocarbons under laboratory conditions. To determine whether PCB alterations are the result of light-catalyzed reactions, it is necessary to verify PCB photolysis, to define the products of photolysis, and to explain the conditions and mechanisms necessary to produce such reactions. It is the purpose of this report to review the literature concerning photoalteration of PCBs and the potential role of this mechanism to facilitate PCB remediation at the research site.

1778 (CORR–84-00054) **Mercury migration into ground water, a literature study.** Carlton, W.H.; Carden, J.L.; Kury, R.; Eichholz, G.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95002667. Source: OSTI; NTIS; GPO Dep.

This report presents a broad review of the technical literature dealing with mercury migration in the soil. The approach followed was to identify relevant articles by searching bibliographic data bases, obtaining the promising articles and searching these articles for any additional relevant citations. Eight catagories were used to organize the literature, with a review and summary of each paper. Catagories used were the following: chemical states of mercury under environmental conditions; diffusion of mercury vapor through soil; solubility and stability of mercury in environmental waters; transport of mercury on colloids; models for mercury migration through the environment; analytical techniques; retention of mercury by soil components; formation of organomecurials.

1779 (DOE/ER/14083–2) **Tensor controlled-source audio-magnetotelluric survey over the Sulphur Springs Thermal area, Valles Caldera, New Mexico, U.S.A.; implication for structure of the western Caldera and for CSAMT methodology.** Wannamaker, P.E. Utah Univ., Salt Lake City, UT (United States). Jun 1994. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER14083. (ESL–93033-TR). Order Number DE95001765. Source: OSTI; NTIS; GPO Dep.

We have carried Out an extensive tensor CSAMT survey of the Sulphur Springs geothermal area, Valles Caldera, New Mexico. This survey, consisting of 45 high-quality sites, has been acquired by in support of Continental Scientific Drilling Program (CSDP) drillholes VC-2A and VC-2B. Two independent transmitter dipoles were energized for tensor measurements using a 30 kW generator placed approximately 13 km south of the VC-2B wellhead. The soundings in the Sulphur Springs area were arranged in four profiles to cross major structural features. The electric bipoles parallel to each profile were deployed contiguously to ensure against spatial aliasing of the impedance response corresponding to current flow across structural trends. The frequency range of acquisition was 4096 Hz down to 1 Hz for the central line, but only down to 4 Hz for most sites of the other lines. Data quality is high overall and is established by repeatability of measurements. Agreement between the CSAMT and available natural field MT data is very good over almost all the period range of overlap indicating that we are free of calibration problems and that far-field results are generally being obtained. Non plane-wave effects in the CSAMT around Sulphur Springs are apparent at 1 to 2 Hz, and perhaps slightly even at 4 Hz, however, which is near the bottom of our frequency range. CSAMT and MT data taken outside the Valles Caldera to the west were modeled in an attempt to compare resistivity structure exterior to the caldera to that within. With the availability of tensor CSAMT and MT data both inside and outside Valles Caldera, assumptions and methods of CSAMT are tested. In the Sulphur Springs area, near-coincident CSAMT and MT data near well VC -2B indicate that non-lane-wave effects in the apparent resistivity and impedance phase occure at a frequency near to that predicted from the resistivity structure local to the wester caldera.

1780 (DOE/ER/60773–4) **Fundamental quantitative analysis of microbial activity in aquifer bioreclamation.** Rittman, B.E. (Univ. of Illinois, Urbana, IL (United States). Dept. of Civil Engineering); Valocchi, A.J.; Baveye, P. Illinois Univ., Urbana, IL (United States). Dept. of Civil Engineering. Aug 1993. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-89ER60773. Order Number DE94014597. Source: OSTI; NTIS; GPO Dep.

In situ bioremediation of hazardous organic chemicals that contaminate aquifer solids and ground water is a highly promising technique for many sites at DOE facilities. Its potential stems from having agents for destruction of the contaminants (bacteria) close to the separate-phase liquid or sorbed contaminants. This project was designed to advance knowledge in several of the microbiological fundamentals most important to in situ bioremediation: biodegradation of poorly soluable organic contaminants; dual limitation kinetics of electron donors and acceptors; kinetics of sequential degradation involving oxygenase reaction; biologically induced clogging in porous media, and two dimensional modeling of biofilm reactions in non homogeneous porous media.

1781 (DOE/ER/60845–4) **Anionic co-contaminants and the biogeochemical evolution of aquifer heterogeneity: Technical progress report, 1 August 1993–31 July 1994.** Fish, W. Oregon Graduate Inst. of Science and Technology, Portland, OR (United States). Dept. of Environmental Science and Engineering. May 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-89ER60845. Order Number DE95001326. Source: OSTI; NTIS; GPO Dep.

Organic acids, chelators, and radionuclide-organic complexes are key contaminants at DOE waste sites. The proposed research

addresses a critical need for experimental determinations of the surface and solution interactions of mixtures of these components in naturally heterogeneous aquifer materials. Three related hypotheses are addressed in this project: The hypotheses are being be tested with co-contaminants and subsoils representative of DOE sites. Target solutes are oxalic acid, EDTA, Co(II)EDTA, and natural humic acid. Batch, mini-column, and conventional column methods will be used and results analyzed with numerical models of coupled chemical transport processes. Project findings will be linked to collaborative intermediate- and field-scale studies. This report outlines the advances that have been accomplished within this first year. In particular, we have made substantial progress in demonstrating that the heterogeneity aquifer materials indeed evolves over time in the presence of dissolution-promoting co-contaminants.

1782 (DOE/ID–10390(94)-Rev.1) **Idaho National Engineering Laboratory site development plan.** Idaho National Engineering Lab., Idaho Falls, ID (United States). Sep 1994. 174p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001906. Source: OSTI; NTIS; INIS; GPO Dep.

This plan briefly describes the 20-year outlook for the Idaho National Engineering Laboratory (INEL). Missions, workloads, worker populations, facilities, land, and other resources necessary to fulfill the 20-year site development vision for the INEL are addressed. In addition, the plan examines factors that could enhance or deter new or expanded missions at the INEL. And finally, the plan discusses specific site development issues facing the INEL, possible solutions, resources required to resolve these issues, and the anticipated impacts if these issues remain unresolved.

1783 (DOE/ID–22112) **Stable isotopes of hydrogen and oxygen in surface water and ground water at selected sites on or near the Idaho National Engineering Laboratory, Idaho.** Ott, D.S.; Cecil, L.D.; Knobel, L.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1994. 18p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). (USGS-OFR–94-55). Order Number DE95001914. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Open-File Reports Section, Box 25286, Denver Federal Center, Denver, CO 80225; GPO Dep.

Relative stable isotopic ratios for hydrogen and oxygen compared to standard mean ocean water are presented for water from 4 surface-water sites and 38 ground-water sites on or near the Idaho National Engineering Laboratory (INEL). The surface-water samples were collected monthly from March 1991 through April 1992 and after a storm event on June 18, 1992. The ground-water samples either were collected during 1991 or 1992. These data were collected as part of the US Geological Survey's continuing hydrogeological investigations at the INEL. The relative isotopic ratios of hydrogen and oxygen are reported as delta ^{2}H ($\delta^{2}H$) and as delta ^{18}O ($\delta^{18}O$), respectively. The values of $\delta^{2}H$ and $\delta^{18}O$ in water from the four surface-water sites ranged from -143.0 to -122 and from -18.75 to -15.55, respectively. The values of $\delta^{2}H$ and $\delta^{18}O$ in water from the 38 ground-water sites ranged from -141.0 to -120.0 and from -18.55 to -14.95, respectively.

1784 (DOE/ID–22113) **Concentrations of dissolved radon-222 in water from selected wells and springs in Idaho, 1989-91.** Cecil, L.D.; Parliman, D.J.; Edwards, D.D.; Young, H.W. Geological Survey, Idaho Falls, ID (United States). 1994. 43p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). (USGS/OFR–94-66). Order Number DE95002016. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Report Section, Box 25286, Mail Stop 517, Federal Center, Denver, CO 80225 (United States); GPO Dep.

Concentrations of dissolved radon-222, a naturally occurring radioactive gas, are found in water in Idaho. The U.S. Geological Survey collected water samples for radon-222 analyses from 338 Idaho wells and springs during 1989-91. These water samples were collected as part of ongoing monitoring programs with the Idaho Department of Water Resources and the U.S. Department of Energy. Concentrations of dissolved radon-222 in 372 of the water samples ranged from -58±30 to 5,715±66 picocuries per liter; the mean and median concentrations were 446±35 and 242±25 picocuries per liter, respectively.

1785 (DOE/ID–22114) **Radionuclides, inorganic constituents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992.** Bartholomay, R.C.; Edwards, D.D.; Campbell, L.J. Idaho Dept. of Water Resources, Boise, ID (United States). 1994. 46p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). (USGS-OFR–94-76). Order Number DE95001912. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225; GPO Dep.

The U.S. Geological Survey and the Idaho Department of Water Resources, in response to a request from the U.S. Department of Energy, sampled 18 sites as part of a long-term project to monitor water quality of the Snake River Plain aquifer from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman area. Water samples were collected and analyzed for selected radionuclides, inorganic constituents, organic compounds, and bacteria. The samples were collected from 13 irrigation wells, 1 domestic well, 1 spring, 2 stock wells, and 1 public supply well. Quality assurance samples also were collected and analyzed. None of the samples analyzed for radionuclides, inorganic constituents, or organic compounds exceeded the established maximum contaminant levels for drinking water. Most of the radionuclide and inorganic constituent concentrations exceeded their respective reporting levels. Most of the samples analyzed for surfactants and dissolved organic carbon had concentrations that exceeded their reporting levels. None of the samples contained reportable concentrations of purgeable organic compounds or pesticides. Total coliform bacteria was present in nine samples.

1786 (DOE/LLW–207) **Use of engineered soils and other site modifications for low-level radioactive waste disposal.** EG and G Idaho, Inc., Idaho Falls, ID (United States); International Technology Corp., Albuquerque, NM (United States). Aug 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (INEL/MISC–94059). Order Number DE95002014. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Nuclear Regulatory Commission requires that low-level radioactive waste (LLW) disposal facilities be designed to minimize contact between waste and infiltrating water through the use of site design features. The purpose of this investigation is to identify engineered barriers and evaluate their ability to enhance the long-term performance of an LLW disposal facility. Previously used barriers such as concrete overpacks, vaults, backfill, and engineered soil covers, are evaluated as well as state-of-the-art barriers, including an engineered sorptive soil layer underlying a facility and an advanced design soil cover incorporating a double-capillary layer. The purpose of this investigation is also to provide information in incorporating or excluding specific engineered barriers as part of new disposal facility designs. Evaluations are performed using performance assessment modeling techniques. A generic reference disposal facility design is used as a baseline for comparing the improvements in long-term performance offered by designs incorporating engineered barriers in generic and humid environments. These evaluations simulate water infiltration through the facility, waste leaching, radionuclide transport through the facility, and decay and ingrowth. They also calculate a maximum (peak annual) dose for each disposal system design. A relative dose reduction factor is calculated for each design evaluated. The results of this investigation are presented for concrete overpacks, concrete vaults, sorptive backfill, sorptive engineered soil underlying the facility, and sloped engineered soil covers using a single-capillary barrier and a double-capillary barrier. Designs using combinations of barriers are also evaluated. These designs include a vault plus overpacks, sorptive backfill plus overpacks, and overpack with vault plus sorptive backfill, underlying sorptive soil, and engineered soil cover.

1787 (DOE/MC/28245–3909) **Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994–June 30, 1994.** Atomic Energy of Canada Ltd., Chalk River, ON (Canada).

[1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28245. Order Number DE95002462. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to design and develop a physico-chemical treatment process for the removal of uranium and heavy metals from contaminated soil to achieve target contamination levels below 35 pCi/g of soil and a target for non-radioactive heavy metals below concentration levels permissible for release of the soil. The work will involve bench-scale and pilot-scale tests, using chelation-flotation, chemical leaching and ultrasonic leaching techniques, in conjunction with cross-flow microfiltration and filter-press operations. The effectiveness of an integrated process to treat leachates generated from soil processing will be demonstrated. Process flow-sheets suitable for in-situ and ex-situ applications will be developed and preliminary costs will be provided for the soil and leachate treatment technologies.

1788 (DOE/MC/29109–3898) **Road Transportable Analytical Laboratory (RTAL) System: Quarterly technical report, March 1993–May 1993.** Engineering Computer Opteconomics, Inc., Annapolis, MD (United States). 28 Jun 1993. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE95002509. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this contractual effort is the development and demonstration of a Road Transportable Analytical Laboratory (RTAL) system to meet the unique needs of the Department of Energy (DOE) for rapid, accurate analysis of a wide variety of hazardous and radioactive contaminants in soil, groundwater, and surface waters. This laboratory system will provide the field and laboratory analytical equipment necessary to detect and quantify radionuclides, organics, heavy metals and other inorganics, and explosive materials. The laboratory system consists of individual laboratory modules deployable independently or as an interconnected group to meet each DOE site's specific needs. Modules originally considered for inclusion in the system were: Radiochemistry Laboratory; Chemical Analysis Laboratory; Biomonitoring Laboratory; Field Analytical Instrument Laboratory; Robotic Sampler/Monitor Base Station; Decontamination Trailer; Operations Control Center; and Protected Living Quarters. However, after evaluating the needs of the DOE field activities and investigating alternative system designs, covered in this report, the modules included as part of the RTAL are: Radioanalytical Laboratory; Organic Chemical Analysis Laboratory; Inorganic Chemical Analysis Laboratory; Aquatic Biomonitoring Laboratory; Field Analytical Laboratory; Robotics Base Station; Decontamination/Sample Screening Module; Operations Control Center; and Protected Living Quarters.

1789 (DOE/NV/11432–162) **Status of the flora and fauna on the Nevada Test Site, 1993: Results of continuing basic environmental monitoring, January through December 1993.** Hunter, R.B. (comp.). Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States). Sep 1994. 313p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-94NV11432. Order Number DE95001495. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the results of monitoring of plants and animals on the Nevada Test Site during calendar year 1993. Monitoring was accomplished under the Department of Energy's Basic Environmental Compliance and Monitoring Program, initiated in 1987. The program looks at both baseline study areas, chosen to represent undisturbed conditions as much as possible, and areas disturbed by Department of energy (DOE) activities or natural phenomena. DOE disturbances studied include areas blasted by above-ground nuclear tests before 1962, subsidence craters created by underground nuclear tests, road maintenance activities, areas cleared for drilling, and influences of man-made water sources. Natural phenomena studied include recovery from range fires, effects of introduced species, damage to plants by insect outbreaks, and effects of weather fluctuations. In 1993 disturbances examined included several burned areas and roadsides, a drill pad on Pahute Mesa, introduced grasses and shrub removal effects on ephemeral plants, and effects on pine trees of an infestation of pinyon needle scale insects.

1790 (DOE/OR–01-1288-D2) **Work plan for the treatability study for PCB dehalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Aug 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–224-D2). Order Number DE95002301. Source: OSTI; NTIS; INIS; GPO Dep.

This work Plan describes the treatability study for Polychlorinated biphenyl (PCB) debalogenation by Agent 313 (a registered trademark of the A.L. Sandpiper Corporation of Columbus, ohio) to be conducted at Waste Area Grouping (WAG) 11 on the Oak Ridge Reservation. The study will be conducted at WAG 11 as a result of the contamination of several small areas of soil by leaking capacitors. The primary purpose of this treatability study is to demonstrate the effectiveness of Agent 313 in remediating PCB-contaminated soil. However, the WAG 11 soils to be treated may also contain radionuclides and metals. In addition to providing the procedures to be followed during the treatability study, the work plan briefly describes the project background and technology, lists applicable or relevant and appropriate requirements for the project, and delineates project goals and objectives. This document also follows the general suggested outline for treatability study work plans shown in the 1992 report Guide for conducting Treatability Studies Under CERCLA: Final, EPA;540/R-92-071a, published by the US Environmental Protection Agency.

1791 (DOE/OR/21755–T4) **Shallow groundwater investigations at Weldon Spring, Missouri: Final report for fiscal years 1988-1990.** Missouri Univ., Rolla, MO (United States). Dept. of Natural Resources. Jun 1991. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-87OR21755. Order Number DE95002776. Source: OSTI; NTIS; INIS; GPO Dep.

The Missouri Department of Natural Resources, Division of Geology and Land Survey (MDNR-DGLS) conducted investigations of the upper aquifer in the vicinity of the abandoned Weldon Spring Chemical Plant in southwest St. Charles County, Missouri. The study began October 1, 1987, and concluded September 30, 1990. The study area included most of the original Weldon Springs Ordinance Works property plus a smaller area to the northeast between U.S. Highway 40-61 and Dardenne Creek. The investigations included a literature review, classification of stream segments as gaining (effluent) or losing (influent), location of springs, water tracing tests, testing of the spontaneous potential geophysical technique, continuous gaging of selected streams and continuous water-level monitoring in selected monitoring wells. The objective of the investigation was to better define the relationships between precipitation, surface runoff, groundwater recharge and shallow groundwater discharge within the study area, thereby assisting the Department of Energy in designing an appropriate groundwater monitoring plan for the Weldon Spring Site Remedial Action Project. A review of literature revealed that a number of reports had been written pertaining to shallow groundwater hydrology near the Weldon Spring site; five by the U.S. Geological Survey and several short ones by the MDNR-DGLS. These reports noted various aspects about the hydrology of the area including the locations of some springs and losing streams, the presence of some subsurface hydrologic connections and some piezometric data. Using these data as a base, eleven surface water drainages around the site were examined during various climatic conditions to locate springs and identify losing stream stretches. Seventy-five springs were located and losing stream stretches were identified in nine of the eleven surface-water drainages.

1792 (EGG-CIET–11399) **Nitrate analysis of snow and ice core samples collected in the vicinity of a waste detonation event, McMurdo Station, Antarctica.** White, G.J.; Lugar, R.M.; Crockett, A.B. Idaho National Engineering Lab., Idaho Falls, ID (United States). Jul 1994. 7p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002009. Source: OSTI; NTIS; INIS; GPO Dep.

On December 30, 1991, a small quantity of hazardous materials was detonated at a site near McMurdo Station, Antarctica. The materials involved in the detonation represented highly reactive or

explosive wastes that could not be transported safely for disposal in the United States. Detonation was therefore considered the safest and most effective means for disposing these hazardous materials. One concern regarding the detonation of these substances was that the process could generate or distribute measurable quantities of contaminants to the area surrounding the detonation site. Nitrate was selected as a tracer to document the distribution of contaminants from the detonation. Snow and ice cores were collected about 4 months after the event. These cores were analyzed for nitrate concentrations in May 1993, and a map was generated to show the extent of nitrate contamination. This report describes the collection of these samples and summarizes the analytical results.

1793 (EGG-EST–9222-Vol.1) **U.S. Fish and Wildlife Service lands biomonitoring operations manual.** Rope, R.; Breckenridge, B. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1993. 1131p. Sponsored by Department of the Interior, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001909. Source: OSTI; NTIS; GPO Dep.

The Biomonitoring Operations Manual is a document developed for the U.S. Fish and Wildlife Service to provide a systematic and consistent approach to contaminant monitoring on lands managed by the Service. The document improves the process for identifying impacts from contaminants affecting Service managed resources and enhances the Service's collection of known and consistent quality data so comparisons can be made among different management areas. The Manual is part of a larger effort to monitor the status and trends of contaminants in resources managed by the Service. The Biomonitoring of Environmental Status and Trends (BEST) program may use information from the Manual and the Biomonitoring Operations Workbook (Workbook) to identify problems or test site specific approaches that can be applied to a regional or national effort. Many methods identified in the Manual are being considered for inclusion in the BEST program. The two efforts are designed to be complementary although the statistical designs may vary because of the slightly different objectives. The approach described requires Service personnel to identify the contaminant sources, the associated contaminants, and the different media/biota of the ecosystem that can be affected by contaminants. The contaminant transport pathways are then determined and a conceptual diagram of the system is developed to help identify the optimum components of the ecosystem to monitor. The data collected will allow the Service to identify the status of contaminants, their effects, and associated risks to the resource. The Service will be able to establish priorities for addressing contaminant related concerns on the Service lands. Sampling methods for five media, field oriented sampling summary sheets, decontamination guidance, documentation and quality assurance/quality control (QA/QC) standard operating procedures are also provided in the manual.

1794 (EGG-GEO–10797-Rev.2) **GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2.** Rood, A.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1994. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002006. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.

Multimedia exposure assessment of hazardous chemicals and radionuclides requires that all pathways of exposure be investigated. The GWSCREEN model was designed to perform initial screening calculations for groundwater pathway impacts resulting from the leaching of surficial and buried contamination at CERCLA sites identified as low probability hazard at the INEL. In Version 2.0, an additional model was added to calculate impacts to groundwater from the operation of a percolation pond. The model was designed to make best use of the data that would potentially be available. These data include the area and depth of contamination, sorptive properties and solubility limit of the contaminant, depth to aquifer, and the physical properties of the aquifer (porosity, velocity, and dispersivity). For the pond model, data on effluent flow rates and operation time are required. Model output includes the limiting soil concentration such that, after leaching and transport to the aquifer, regulatory contaminant levels in groundwater are not exceeded. Also, groundwater concentration as a function of time may be calculated. The model considers only drinking water consumption and does not include the transfer of contamination to food products due to irrigation with contaminated water. Radiological dose, carcinogenic risk, and the hazard quotient are calculated for the peak time using the user-defined input mass (or activity). Appendices contain sample problems and the source code listing.

1795 (ES/ER/TM–120/V1) **Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 1, Introduction.** Oak Ridge National Lab., TN (United States). Sep 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001384. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Environmental Restoration Program at Martin Marietta, IEM (Information Engineering Methodology) was developed as part of a complete and integrated approach to the progressive development and subsequent maintenance of automated data sharing systems. This approach is centered around the organization's objectives, inherent data relationships and business practices. IEM provides the Information Systems community with a tool kit of disciplined techniques supported by automated tools. It includes seven stages: Information Strategy Planning; Business Area Analysis; Business System Design; Technical Design; Construction; Transition; Production.

1796 (ES/ER/TM–120/V2) **Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 2, Interim business systems guidance.** Oak Ridge National Lab., TN (United States). Sep 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001385. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Environmental Restoration Program at Martin Marietta, IEM (Information Engineering Methodology) was developed as part of a complete and integrated approach to the progressive development and subsequent maintenance of automated data sharing systems. This approach is centered around the organization's objectives, inherent data relationships, and business practices. IEM provides the Information Systems community with a tool kit of disciplined techniques supported by automated tools. It includes seven stages: Information Strategy Planning; Business Area Analysis; Business System Design; Technical Design; Construction; Transition; Production. This document focuses on the Business Systems Architecture.

1797 (IC–94/104) **Physico-chemical and mineralogical properties influencing water-stability of aggregates of some Italian surface soils.** Mbagwu, J.S.C. (International Centre for Theoretical Physics, Trieste (Italy)); Bazzoffi, P.; Unamba Oparah, I. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 20p. Order Number DE95606006. Source: OSTI; NTIS (US Sales Only); INIS.

A laboratory study was conducted to determine the relationship between physical, chemical and mineralogical properties of some surface soils (developed in north central Italy) and the stability of their aggregates to water. The index of stability used is the mean-weight diameter of water-stable aggregates (MWD). The ratio of total sand to clay which correlated negatively with MWD ($r=-0.638$) is the physical property which explained most of the variability in aggregate stability. The chemical properties which correlated best with aggregate stability are FeO ($r=0.671$), CaO ($R=0.635$), $CaCO_3$ ($r=0.651$) and SiO_2 ($r=-0.649$). Feldspar, chlorite and calcite are the minerals which influence MWD most, with respective "r" values of -0.627, 0.588 and 0.550. The best-fit model developed from soil physical properties explained 59% of the variation in MWD with a standard error of 0.432, that developed from chemical properties explained 97% of the variation in MWD with a standard error of 0.136, whereas the model developed from mineralogical properties explained 78% of the variation in MWD with a standard error of 0.222. Also the closest relationship between measured and model-predicted MWD was obtained with the chemical properties-based model ($r=0.985$), followed by the mineralogical properties-based model ($r=0.884$) and then the physical properties-based model

(r=0.656). This indicates that the most reliable inference on the stability of these soils in water can be made from a knowledge of the amount and composition of their chemical constituents. (author). 32 refs, 1 fig., 9 tabs.

1798 (IC–94/105) **A multivariate analysis of intrinsic soil components influencing the mean-weight diameter of water-stable aggregates.** Mbagwu, J.S.C. (International Centre for Theoretical Physics, Trieste (Italy)); Chukwu, W.I.E.; Bazzoffi, P. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 20p. Order Number DE95606007. Source: OSTI; NTIS (US Sales Only); INIS.

A knowledge of the soil properties influencing the water-stability of soil aggregates is needed for selecting those more easily-determined properties that would be useful in areas where lack of facilities makes its direct determination impossible. In this laboratory study we evaluated the main soil physical, chemical and mineralogical properties influencing the stability of macro aggregates of some Italian surface soils in water. The objective is to select a subset of soil properties which predict optimally, soil aggregate stability. The index of stability used is the mean weight diameter of water-stable aggregates whereas the method of evaluation is the principal component analysis (PCA). The range in coefficients of variation (CV) among the properties was least in the physical (12.0-61.0%), medium in the mineralogical (28.0-116.2%) and highest in the chemical (8.2-110.8%) properties. The wider the range in CV in each subset of properties, the greater the number of components extracted by the PCA. The component defining variables, i.e. those with the highest loadings on each component and therefore, provide the best relationship between the variables and aggregate stability, revealed the ratio of total sand/clay and plastic limit as the significant physical properties. The significant chemical properties are Al_2O_3, FeO, MgO and MnO which contribute positively to aggregate stability. Feldspar, quartz and muscovite are the significant mineralogical properties each of which is negatively related to aggregate stability. These soil components are useful for developing empirical models for estimating the stability of aggregates of these soils in water. (author). 38 refs, 7 tabs.

1799 (INIS-BR–3437) **Cs^{137} soil-to-plant transfer factor.** Helene, O.; Scardino, A.M.S. Sao Paulo Univ., SP (Brazil). Inst. de Fisica. [1994]. 3p. Order Number DE95603493. Source: OSTI; NTIS (US Sales Only); INIS.

Cs^{137} soil-to-plant transfer factor has been investigated. The dependence of the transfer factor on the soil pH, and on the plants has been studied. (author).

1800 (INIS-mf–14340, pp. 363-374) **Radionuclide migration from shallow land disposal site.** Yamkate, P.; Srisuksawat, K.; Sriyotha, K.; Sriyotha, P. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Shallow land burial is an alternative method for ultimate disposal of radioactive waste. The burial site for such purpose should bear a suitability on geology, hydrology and climatology. Additionally, the site should be located in an area of low density of population without extensive use in agriculture. Furthermore, the site soil should exhibit a high sorption property. The physico-chemical properties of the site soil are investigated for the distribution coefficient (Kd) of Tc-99, Co-60, Cs-134, Ra-226 and Sr-85. The result shows the variation of Kd-value from less than 0.0 to 328. 18 m/gm which reveals that the migration capability of radionuclides in the soil depends heavily on the characteristics of the radionuclides.

1801 (INIS-mf–14378) **Alligator Rivers Analogue project. Geomorphology and paleoclimatic history: Final Report - Volume 3.** Wyrwoll, K.H. (Univ. of Western Australia, Nedlands, WA (Australia)). Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 93p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95606009. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of this volume is to discuss the likely influence of geomorphological and palaeoclimatic controls on the development of the secondary dispersion fan at Koongarra. For the Koongarra area the Phanerozoic was a time of tectonic stability and predominantly subaerial denudation. The structural geology of the region facilitated the erosion of the Kombolgie Formation, setting in train the development of Koongarra Valley. With the removal of the Kombolgie cover the surface of the Cahill Formation could then be eroded. The geochemical controls on the development of the secondary dispersion fan require the orebody to be located in an oxidising weathering environment. Under the present weathering regimes it seems that this implies that the orebody is located at a depth of less than 30 m. From estimates of the present regional denudation rates of the area and wider geomorphological considerations, it is concluded that the top of the orebody would have reached such a depth at some time in the last 1-6 million years. The climates of the Late Quaternary provide some guide to Pleistocene climatic events. The most intense aridity coincided with times of global glacial maxima. There is also evidence that in the Late Cenozoic there were times of elevated rates of chemical weathering. However, the timing, nature and duration of such events is unclear. 171 refs., 4 tabs., 35 refs.

1802 (INIS-mf–14380) **Alligator Rivers Analogue project. Groundwater Chemistry: Final Report - Volume 7.** Edis, R. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia)); Waite, D.; Herczeg, A.L.; Sekine, Keiichi; Yanase, Nobuyuki; Seo, Toshihiro. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 185p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95605960. Source: OSTI; NTIS (US Sales Only); INIS.

The objective of this volume is to provide an account of the groundwater sampling and analysis program undertaken at Koongarra, as part of the Alligator Rivers Analogue Project. Chemical parameters were investigated in groundwaters at various locations and depths in the vicinity of the Koongarra orebody. Measurements of the pH, redox state, conductivity, and bicarbonate alkalinity provided a starting point for interpreting water chemistry. Groundwater samples were obtained using submersible pumps, or, in a few cases, bailers. The concentrations of major cations and anions, such as magnesium and phosphate, were determined using a variety of standard techniques. Numerous elements were routinely analysed using quantitative or semi-quantitative ICPMS. Uranium series radionuclides and environmental isotopes were measured using radiochemical techniques and mass spectrometry. The distributions of isotopes such as deuterium, tritium, ^{210}Pb, ^{13}C and ^{14}C enabled groundwater mixing and flow-paths to be studied. The occurrence and distributions of major species at Koongarra are presented in this volume, using both cross-sections and contour plans. Chemical and isotopic data for groundwater analyses carried out during the project are included in the Appendices. 47 refs., 16 tabs., 58 figs.

1803 (INIS-mf–14381) **Alligator Rivers Analogue project. Weathering and its effects on uranium redistribution: Final Report - Volume 9.** Isobe, H. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Ohnuki, T.; Yanase, N.; Sato, T.; Kimura, H.; Sekine, K.; Nagano, T.; Edis, R.; Klessa, D.A.; Conoley, C.; Nakashima, S.; Ewing, R.C. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 138p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95605961. Source: OSTI; NTIS (US Sales Only); INIS.

In the vicinity of the uranium ore deposit at Koongarra, quartz-chlorite schist, the ore host rock, has been subjected to weathering. Although quartz is resistant to weathering, chlorite has been altered to clays and iron minerals. The chlorite weathering and the uranium association with the weathered minerals are the main topics of this study. In order to clarify the weathering of chlorite and its effects on the redistribution of uranium, the processes, mechanisms, and kinetics of the chlorite weathering, and the uranium concentrations in minerals were examined by various methods: X-ray diffraction analysis, scanning electron microscopy, electron microprobe analysis, transmission electron microscopy, autoradiography, visible spectroscopy, alpha and gamma spectrometry. The observed results were compared to those calculated,

based on two different models developed for the present study. Water-rock interactions have resulted in the weathering of chlorite and precipitation and sorption of uranyl from the groundwaters with the weathering products. It is concluded that the chlorite weathering affects the uranium retardation factor, and thus uranium redistribution at Koongarra. 55 refs., 20 tabs., 120 figs.

1804 (INIS-mf–14382) **Alligator Rivers Analogue project. Geochemical Data Bases: Final Report - Volume 10.** Bennett, D.G. (W.S. Atkins Environment, Epsom, Surrey (United Kingdom)); Read, D. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 56p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95605962. Source: OSTI; NTIS (US Sales Only); INIS.

The Koongarra uranium deposit in the Northern Territory of Australia is being studied to evaluate the processes involved in the geochemical alteration of the ore body and the formation of the uranium dispersion fan. A broad range of research is being undertaken into the geochemistry and hydrology of the site with the aim of understanding the transport of radionuclides through the system. During the project a range of geochemical and hydrogeochemical models have been developed to account for measured data from the site and with which to predict site evolution. The majority of these models are based on the premise of thermodynamic chemical equilibrium and employ fundamental thermodynamic data to characterise the chemistry of the system. From the differences which exist between the thermodynamic data bases (Appendices I and II) it is possible to gain a view of the level of uncertainty associated with thermodynamic data in each set of calculations. This report gives a brief introduction to the geochemical processes underlying the models, and details the equations used to quantify the more common of these processes (e.g. aqueous speciation and mineral solubility). A description is given of the computer codes (EQ3/6, PHREEQE, MINTEQ) most commonly used during the project for geochemical modelling. Their key features are highlighted and comparisons made. It is concluded that the degree of uncertainty in geochemical modelling studies arising as a result of using one code rather than another is relatively insignificant when compared to that related to differences in the underlying data bases. 73 refs., 3 figs.

1805 (INIS-mf–14383) **Alligator Rivers Analogue project. Geochemistry of ^{239}Pu, ^{129}I, ^{99}Tc and ^{36}Cl: Final Report - Volume 15.** Fabryka-Martin, J.T. (Los Alamos Scientific Lab., NM (United States)); Curtis, D.B. Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). 1992. 82p. Sponsored by Nuclear Energy Agency, 75 - Paris (France). Order Number DE95605963. Source: OSTI; NTIS (US Sales Only); INIS.

One objective of this research programme has been to evaluate the applicability of uranium orebodies as natural analogues for testing radionuclide release-rate models used in performance assessment activities. The investigated nuclides included three of the most persistent radioactive constituents of high-level wastes from nuclear fission power reactors: plutonium-239, iodine-129, and technetium-99. The feasibility of uranium minerals as analogues for the behavior of these nuclear reaction products (NRP) in spent fuel relies upon a capability to characterise NRP concentrations in the source minerals. Measured abundances of natural ^{239}Pu, ^{99}Tc and ^{129}I in uranium ores are compared to calculated abundances in order to evaluate the degree to retention of these radionuclides by the ore. This modelling study also shows the extent to which various NRP are correlated, such that one provides a constraint on the production rates of others. Under most conditions, ^{36}Cl, another long-lived neutron-capture product found in uranium ores, is shown to be an ideal in-situ monitor of the ^{235}U fission rate, which is the dominant source term for ^{129}I and possibly a significant one for ^{99}Tc. Similarly, ^{239}Pu/U ratios can be used to establish limits on the ^{238}U neutron-induced fission rate; the ratios measured in this study suggest that ^{238}U induced fission comprises < 4% of the total fissions in most of the ore samples studied and hence can be neglected as a source of ^{129}I and ^{99}Tc. 79 refs., 21 tabs., 18 figs.

1806 (INIS-mf–14384) **The effect of weathering on the distribution of uranium and associated elements at Koongarra, Northern Territory, Australia.** Edis, Robert (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia)). Sydney Univ., NSW (Australia). Mar 1992. 162p. Sponsored by Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Order Number DE95605964. Source: OSTI; NTIS (US Sales Only); INIS.

A thesis submitted to the Faculty of Agriculture of the University of Sydney in fulfilment of the requirements for the degree of Master of Science in Agriculture.

The aim of work described in this thesis was to investigate some aspects of the redistribution of U and other elements, at the Koongarra No.1 U ore deposit in the Northern Territory of Australia. Aspects of the redistribution of U which are considered in this thesis include the spatial patterns of remobilised U; the associations of U with minerals and elements and how these change with weathering, and transport of material by colloids present in the groundwater. The Koongarra No.1 U ore deposit is currently being studied as a natural analogue of a high level radioactive waste repository, as part of the Alligator Rivers Analogue Project. As spent fuel is a proposed waste form for geological burial, the study of uraninite leaching in an ore body makes a very good analogue of a breached repository. Work presented in this thesis was undertaken as part of that study. Aspects of the redistribution considered here include spatial patterns of redistributed U, associations between U, other elements and minerals, and transport of material by groundwater colloids. Techniques employed include:- thin section analyses (optical analysis, autoradiography, electron microprobe, and scanning electron microscopy); mineralogical and chemical analyses (x-ray diffraction, x-ray fluorescence, PIXE-PIGME, neutron activation, and infra-red spectrophotometry); groundwater colloid sampling and concentrating (tangential and stirred cell ultrafiltration); transmission electron microscopy for the examination of colloids and scanning electron microscopy for the examination of prefilters. The redistribution of U during weathering appeared to follow the distribution of Fe oxides. Uranium present in the groundwater responsible for the weathering would then have absorbed onto the freshly precipitated and highly sorptive Fe oxides. Uranium concentrations appeared to be correlative to the degree of weathering, and the corresponding amount of Fe oxides. 339 refs., 36 tabs., 83 figs.

1807 (INIS-mf–15063, pp. 567-582) **On the research program forest decline at the site 'Postturm', forest district Farchau/Ratzeburg.** Bauch, J. (Ordinariat fuer Holzbiologie, Hamburg Univ. (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

The Federal Ministry of Research and Technology, Bonn, supports since 1985 an interdisciplinary research project on forest decline at the forest district Farchau/Ratzeburg in northern Germany. There is a damaged old growth of mainly spruce (Picea abies (L.) Karst.) located at 60-80 m NN and 30 km apart of Hamburg. There are field stations for continuous measurement of concentrations and depositions of anorganic air pollutants and determination of organic compounds. Biological experiments are carried out to examine the interrelation between air pollutants and tree response. The stress exserted on fine roots via the soil is also considered. In addition, growth and wood characteristics are investigated, and genetic aspects are studied within this program. So far it turned out that above all short periods of exposure to gaseous pollutants may cause stress reactions of the trees. Dry depositions, particularly lead, are considerably high. An insufficient availability of divalent mineral nutrients parallel to an increased Al-antagonism in the mineral soil and a high lead content in the humus layer may seriously contribute to the stress shown by the spruce trees at that site. The program will be continued for several years. (orig.)

1808 (INIS-mf–15063, pp. 583-596) **Natural and anthropogenic stress in spruce and beech ecosystems in the Solling project.** Murach, D. (Inst. fuer Waldbau, Goettingen (Germany)).

Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

The investigations show that low Ca/Al-ratios in mineral soil horizons cause a shallow root system with spruce. But obviously other soil conditions expect acidification can also be responsible for a shallow root system. Additional investigations and field experiments have to find out the driving forces. A new phenomenon in fine root investigations are the low fine root concentrations in the uppermost mineral soil horizons. It is to be observed with spruce as well as with beech in stands with strong acidification of the top soil. Further experiments are needed to evaluate what are the main chemical variables (pH, heavy metals etc.) In this way soil acidification can cause reductions of fine root biomasses in subsoils as well as in uppermost soil horizons. These reductions can influence the response of trees to water stress. Relations to the symptoms of needle losses with spruce are likely. The close correlations between the chemistry of the soil, the roots and the needles indicate, that the yellowing symptoms of spruce trees, which were related to Mg-deficiency, are caused by Mg-deficiency in the soil. It is to be emphazised that it is not a pure Mg-deficiency. Ion antagonism to Al and especially to H in connection with fine root distribution are of main importance. (orig.)

1809 (INIS-mf--15063, pp. 597-642) **Forest decline research in Northrhine-Westphalia at the regional research site Eggegebirge/Velmerstot.** Prinz, B. (Landesanstalt fuer Immissionsschutz des Landes NRW, Essen (Germany)); Koeth, I.; Krause, G.H.M.; Thiele, V. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

In 1984 Northrhine Westfalia established a research program 'Air Pollution and Forest Decline'. Results of various experiments, carried out on the level of 1. epidemiological observations, 2. semicontrolled experiments in open-to-chambers as well as 3. controlled fumigation experiments are presented as an overview. Emphasis is put on field experiments at the regional research site Eggegebirge/ Velmerstot, where the Landesanstalt fuer Immissionsschutz analysed among others yearly nutrient cycling and leaching phenomena of injured and healthy spruce trees (type: montanious yellowing). Deposition measurements were carried on a horizontal and vertical trajectory outside and inside a young spruce stand. Preliminary results showed that atmospheric acidic deposition accounts only for 1/3 of the acidification of the soil within the stand, where acidification processes are most prevalent. (orig.)

1810 (INIS-mf--15063, pp. 649-666) **Exclusion experiment for gaseous pollutants in spruces at Edelmannshof: concept and first element-budget data.** Seufert, G. (Landeskultur und Pflanzenoekologie, Univ. Stuttgart-Hohenheim (Germany)); Evers, F.H. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

The results presented focus on the translocation of substances in the canopy by water; analyses carried through on the element budget comprise, interalia, ion concentrations in leachate, element contents in needle and litter samples, and concentrations of exchangeable cations in soil. Depositions and leaching from needles depend on air quality. Whereas dissolved and solid phase depositions are identical, stress to trees from the different gas phase variants is non-uniform. Cation losses in the indicated site are immediately compensated by uptake in the area of the roots: so far, no difference in the nutrition status of spruces subjected to different treatments has been established by needle analysis. Provided the soil has sufficient capacity for compensating loss of nutritive elements, leaching processes do not trigger recognizable disturbance of mineral nutrition. (orig.)

1811 (INIS-mf--15063, pp. 667-690) **The effects of acid irrigation and compensation liming on soil and trees in a mature Norway spruce stand (Hoeglwald project).** Kreutzer, K. (Lehrstuhl fuer Bodenkunde, Muenchen Univ. (Germany)); Schierl, R.; Goettlein, A.; Proebstle, P. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

Since 1984 the soil of an around 80 years old spruce stand (Picea abies L. Karst.) was irrigated with acidified water (pH 2.7 - 2.8 by H_2SO_4 resp. pH 5 - 5.5 by H_2CO_3) in 15 to 18 events a 10 - 12 mm per year additionally to natural rain of 500 to 700 mm below canopy with pH mostly between 4.5 - 5.2. The main part of the added acidity was buffered in the mineral top soil by reactions releasing Al $(H_2O)_6^{3+}$. A small part was consumed in the surface humus layer by exchange of Ca, Mg, Mn and K. Up to now the trees do not show any signs of growth reductions, needle losses or discolourations. It seems that defensive mechanisms in the fine root system are responsible for that as active raise of pH on the rhizoplane of fine roots, possibly due to nitrate uptake. Liming, carried out once in April 1984 with 4×10^3 kg ground dolomite per ha, produced a strong increase of the pH only in the upper part of the humus layer, forming a steep pH gradient by depth. That gradient marking the deacidification front is moving downward very slowly with time (around 1 cm/year). Although nitrification was already very active before lime was brought out liming enhanced the nitrate production markedly. At a depth of 20 cm the nitrate concentrations reached 280 mg/l in the soil solution. Liming also enhanced the release of water soluble humic substances. Because of their ability to form stable metal organic complexes with Fe, Cu, Pb and Al, the contents of these metals increased in the soil solutions. (orig.)

1812 (INIS-mf--15063, pp. 707-715) **Input-output balances of acids, heavy metals and nutrients, and compartments of accumulation and depletion in forest ecosystems.** Mayer, R. (Kassel Univ. (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

Forest damage and decline are the consequence of several stress factors acting upon forest ecosystems in various combinations and degrees. Impact of atmospheric pollutants is certainly one of the most prominent of these factors. Regional comparion is facilitated by considering groups of atmospheric substances. We distinguish: 1. Acids and acidifying substances, 2. Heavy metals and 3. Nutrients: N, P, K, Ca, Mg, S. Forest decline has to be recognized as an expression of changes within the forest ecosystem, changes which must be accompanied by a non-steady state of the

material balance. The best way to investigate changes in the material balance is to look at input and output of matter to the ecosystems. A positive balance (input > output) over a period of more than one year means accumulation, negative balance (input < output) means depletion of a substance. Based upon several case studies (Subjects I, K), we come to a typification of the material balance at any individual site which is defined by the immission/deposition situation on the one hand, by the geological-pedological site characteristics on the other hand. (orig.VT)

1813 (INIS-mf–15063, pp. 733-752) **Critical loads for deposition of acid and nitrogen - do we know enough to make the concept useful?.** Tamm, C.O. (Dept. of Ecology and Environmental Research, Swedish Univ. of Acricultural Sciences, Uppsala (Sweden)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

Critical loads for acid deposition of sulphur and nitrogen compounds are useful concepts related to the rate of weathering of primary minerals or to the rate of changes in secondary minerals, as these processes are the most important counteracting processes in a long-term perspective. As nitrogen saturation seldom occurs over large areas in nature, the dominant producers in forest ecosystems, the trees, as well as most of their associated organisms, are not evolutionarily adapted to nitrogen saturation. Large environmental changes will be the consequence of present nitrogen enrichment in regions with high nitrogen deposition. It is a real challenge for the scientific community to define critical loads for different sites, and to inform the public on the consequences of present environmental policies in different countries. (orig./VT)

1814 (INIS-mf–15063, pp. 753-778) **Possibilities and limits of fertilization and melioration liming (as measures to fight 'novel' forest disease).** Rehfuess, K.E. (Lehrstuhl fuer Bodenkunde, Muenchen Univ. (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

The revitalization potential of forest fertilization and liming is assessed by types of disease. Spruces on acid soils in the upper reaches of medium-range mountains have been known to exhibit specific Mg deficiency. In steep southern slopes of the Calcareous Alps a spruce disease is found where trees show nutrition disorders - acute K and Mn deficiency - with characteristic chloroses. In southern Germany, there is incidence of needle reddening as the most prominent type of disease in spruce (connection with K deficiency). Crown overthinning in spruce is likely to be caused by Mg deficiency. The paper discusses nutrition disorders in fir and beech disease. For acidic substrates, melioration liming (dolomite) is recommended. It adjusts the pH value and increases the available amounts of exchangeable Mg and Ca. (VT)

1815 (INIS-mf–15063, pp. 817-851) **Conservation and reconstruction of forests in the medium-range mountains of the German Democratic Republic under the impact of nuisances.** Thomasius, H. (Technische Univ. Dresden, Sektion Forstwirtschaft, Tharandt (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

Paper presenting a silvicultural strategy for areas in the medium-range mountains of the former German Democratic Republic affected by nuisances. A 'conservation strategy' is to be aimed at, which consists in the continued treatment of stands still existing or newly established in the stricken areas. Such areas as have been cleared by the disintegration of stands and clear-felling are to be reforested following a reconstruction scheme. (VT)

1816 (INIS-mf–15063, pp. 853-879) **Case studies and general patterns of ion budgets in North American forests.** Johnson, D.W. (Desert Research Inst., Reno, NV (United States)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

A review of ion budgets for North American forests reveals that Ca is the nutrient most often predicted to become depleted due to a combination of leaching and harvesting in managed forests. Studies of soil change, while few in number, generally support predictions from nutrient budget analyses. In the absence of harvesting, however, there are questions as to whether Ca or any other nutrient cation will become limiting before the system ceases experiencing a net loss of the potentially limiting cation. Theory predicts that nutrient cations in shortest supply will be conserved, while less limiting cations will be leached. Steady-state with regard to inputs and outputs base cations will eventually be reached, and if uptake depletes potentially limiting cations, the system will begin to accumulate them from atmospheric deposition. In the latter case, only harvesting will result in net ecosystem losses of base cations. In a case where all base cations are being conserved, Al will be mobilized with possible attendant negative effets upon tree roots and aquatic systems. Al will be mobilized to a greater extent than base cations from acid soils subject to inputs of mineral acid anions. While there is no direct evidence that soil solution Al concentrations have been increased by atmospheric S and N deposition, theory predicts that this will occur and historical evidence in the form of tree ring chemistry suggests that it has occured in some high-elevation forests. It is unclear as yet whether such Al mobilization has played a role in high-elevation forest decline, however. (orig.)

1817 (INIS-mf–15063, pp. 881-904) **Forest decline in the Southern Appalachian Mountains. Research and observations: 1983-1989.** Bruck, R.I. (Dept. of Plant Pathology, North Carolina State Univ., Raleigh, NC (United States)); Robarge, W.P.; McDaniel, A. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

An insect and desease survey initiated in 1985 on 100 permanent plots has yielded little significant pathology or insect infestation. With the exception the balsam wooly adelgid, few signs or symptoms of disease or insect attack were noted on either Fraser fir or red spruce populations. Cultures from destructively-sampled root systems yielded few significant pathogens that could be attributed to decline symptoms. Measurements of throughfall in 1986 yielded estimates of total wet deposition for NO^{-3} and

SO_4^{-2} of 25 and 75 kg ha^{-1} yr^{-1}, respectively. Cloud and rain water was dominated by H^+, NH^{+4}, NO^{-3}, and SO_4^{-2} ions. Interaction with the forest canopy resulted in an enrichment of throughfall with base cations (K^+, Ca^{+2}, and MG^{+2}) and a loss of H^+ and NH^{+4}. Mean-volume-weighted pH for throughfall was 3.9. The effects of simulated acidic cloud water on the epicuticular waxes of red spruce needles were studied during the summer of 1987. The cuticle proper of both 1986 and 1987 needles did not appear to be damaged by the treatments. The wax crystals which consititute the stomatal wax plugs, however, exhibited substantial degradation by simulated treatments at or below pH 3.5. (orig./VT)

1818 (INIS-mf–15063, pp. 905-912) **Forest damage research programme. Research on atmospheric pollutant deposition in American forests.** Hertel, G. (USDA Forest Service, Broomall, PA (United States)); Brandt, J. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

The possible impact of atmospheric pollutant deposition or 'acid rain' on forest is a major environmental issue in the USA. The National Acid Precipitation Assessment Program (NAPAP) forms important part of an interagency scheme and was evolved on the basis of the activity of a special task force. In NAPAP, the investigation of the question of whether United States forests are damaged by air pollutants is seen as a central task. The individual aims pursued under the program are as follows: (1) Assessment of the impact of roughly environmentally equivalent acid deposition quantities and other oxidants in tree foliage on the productivity and health of the most important tree species. (2) Assessment of the long-term impact of roughly environmentally equivalent acid deposition quantities in different forest soils on the productivity and health of forests. (3) Pinpointing of the crucial factors responsible for externally visible tree injury in the higher ranges of the eastern part of the USA. (4) Stimulation of projects in the fields of biochemistry, physiology and ecology investigating causal relationships between acid deposition and other pollutants. (5) Institution of a programme for the continued documentation and recording of novel phenomena in tree health. (orig.)

1819 (INIS-mf–15063, pp. No pagination) **State of the discussion on standard values for atmospheric pollutant concentrations.** Jaeger, H.J. (Inst. fuer Produktions- und Oekotoxikologie, Bundesforschungsanstalt fuer Landwirtschaft, Braunschweig (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

Air quality criteria are defined according to the state of scientific knowledge. Limiting or standard values for short-duration exposure as derived from numerous experimental results and field observations may be said to provide useful concepts for the protection of vegetation. So far inadequate, however, are the scientific bases for assessing without doubt the hazard potential of prolonged nuisances characterized by greatly varying pollutant concentrations in relation to both time and site and by the incidence of multiple components. (orig./vt)

1820 (INIS-mf–15065, pp. 141-164) **Soil acidification: its extent, development during the last decades, and causes.** Hildebrand, E.E. (Forstliche Versuchs- und Forschungsanstalt Baden-Wuerttemberg, Freiburg im Breisgau (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

During the last decades there has been substantially increasing, extended forest soil acidity in central Europe. The higher the previous saturation in bases had been, the more pronounced was the loss in neutralization capacity. In many northern and central European sites, the rate of protons carried in by wet deposition already exceeds the rate of bases from the soil's buffer activity and from silicate degradation. The resulting, lower pH is buffered by protolysis of Al and Fe oxides. This makes Al the dominant cation in many sites, whose toxicity for forest ecosystems is critically discussed. A part from atmospheric acid deposition, high production and exports of biomass are also liable to cause heavy surface soil acidification locally, but the two types of deposition are basically different. Whereas acidification by organic acids from biomass is restricted to the area between the organic cover layer and the Bh layer, acidification from the deposition of permanently loaded mineral acid anions penetrates beyond the rhizosphere into the C layer and aquifers, endangering the hydrosphere as well. Therefore, the buffering properties of the lithosphere acquire increasing importance. (orig./vhe)

1821 (K/HWP–26) **Field demonstration of rapid turnaround, multilevel groundwater screening.** Tingle, A.R. (Analysas Corp., Oak Ridge, TN (United States)); Baker, L.; Long, D.D.; Miracle, M. Oak Ridge K-25 Site, TN (United States). [1994]. 8p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract AC05-84OT21400. Agreement 2096-H053-A1. (CONF-941189–1: SUPERFUND XV: 15th environmental conference and exhibition for the hazardous materials/hazardous waste management industry, Washington, DC (United States), 29 Nov - 1 dec 1994). Order Number DE94018746. Source: OSTI; NTIS; INIS; GPO Dep.

A combined technology approach to rapidly characterizing source area and downgradient groundwater associated with a past fuel spill has been field tested. The purpose of this investigation was to determine the presence and extent of fuel-related compounds or indications of their biodegradation in groundwater. The distance from the source area to be investigated was established by calculating the potential extent of a plume based only on groundwater flow velocities. To accomplish this objective, commercially available technologies were combined and used to rapidly assess the source area and downgradient groundwater associated with the fuel discharge. The source of contamination that was investigated overlies glacial sand and gravel outwash deposits. Historical data suggest that from 1955 to 1970 as many as 1 to 6 million pi of aviation gasoline (AVGAS) were god at the study area. Although the remedial investigation (RI) for this study area indicated fuel-related groundwater contamination at the source area, fuel-related contamination was not detected in downgradient monitoring wells. Rapid horizontal groundwater velocities and the 24-year time span from the last reported spill farther suggest that a plume of contaminated groundwater could extend several thousand feet downgradient. The lack of contamination downgradient from the source suggests two possibilities: (1) monitoring wells installed during the RI did not intersect the plume or (2) fuel-related compounds had naturally degraded.

1822 (LBL–35056) **Meso-scale cooling effects of high albedo surfaces: Analysis of meteorological data from White Sands National Monument and White Sands Missile Range.** Fishman, B.; Taha, H.; Akbari, H. Lawrence Livermore National Lab., CA (United States). 20 May 1994. 30p. Sponsored by US-DOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE94018535. Source: OSTI; NTIS; GPO Dep.

Urban summer daytime temperatures often exceed those of the surrounding rural areas. Summer "urban heat islands" are caused by dark roofs and paved surfaces as well as the lack of vegetation. Researchers at Lawrence Berkeley Laboratory are interested in studying the effects of increasing the albedo of roof tops and paved surfaces in order to reduce the impacts of summer urban heat islands. Increasing the albedo of urban surfaces may reduce this heat island effect in two ways, directly and indirectly. The direct effect involves reducing surface temperature and, therefore, heat conduction through the building envelope. This effect of surface albedo on surface temperatures is better understood and has been quantified in several studies. The indirect effect is the impact of high albedo surfaces on the near surface air temperatures. Although the indirect effect has been modeled for the Los Angeles basin by Sailor, direct field observations are required. The objective of this report is to investigate the meso-scale climate of a large high albedo area and identify the effects of albedo on the near surface air temperature. To accomplish this task, data from several surface weather stations at White Sands, New Mexico were analyzed. This report is organized into six sections in addition to this introduction. The first gives the general geological, topographic, and meteorological background of White Sands. The second is a discussion of the basic surface meteorology of the White Sands region. This section is followed by a general discussion of the instrumentation and available data. The fourth section is a description of the method used for data analyis. The fifth section which presents the results of this analysis. Finally, the last section is the summary and conclusion, where a discussion of the results is presented.

1823 (NGU–93-152) **Report on joint ecogeochemical mapping and monitoring in the West Murmansk Region and the contiguous areas of Finland and Norway.** Chekushin, V.A. (and others); Bogatyrev, I.V.; Finne, T.E. Norges Geologiske Undersoekelse, Trondheim (Norway). Dec 1993. 132p. Order Number DE95605965. Source: OSTI; NTIS; INIS.

A series of meetings between the Central Kola Survey Expedition, Geological Survey of Finland and Geological Survey of Norway in 1991-1992 led to the implementation of a pilot project of a joint ecogeochemical study of the impacts of industrial activities on the terrestrial systems of West Kola Peninsula and adjacent areas in Finland and Norway. The main aims of this pilot project were to harmonize methods of sampling, preparation, analysis, data treatment and interpretation, focusing on heavy metals and radionuclides. A small area in the three-country field, including Nikel, Zapoljarny and Kirkenes was chosen as test territory. Experiences of the pilot project should form a base for planning a major project to cover some 170000 km^2 in the three countries. Snow cover, terrestrial moss, A_0-horizon, A_{0+2}-horizon, C-horizon, stream water, stream sediments and overbank sediments were used as sampling medias, with 15 sites in each country. A data quality assessment was carried out, and maps of pollutant elements clearly delineate patterns similar to those found by other workers. There is no indication that C-horizon is affected, but results of overbank sediments indicate that there are abnormal conditions with regards to the sediment transport and chemistry in the "industrial desert". Results of $^{134,137}Cs$ determinations in the uppermost 5 cm of the soil profile show no alarming levels. An attempt at modelling the flux of contaminants has also been made. 29 refs., 54 figs., 9 tabs.

1824 (NUREG/CR–6203) **Validation studies for assessing unsaturated flow and transport through fractured rock.** Bassett, R.L. (Arizona Univ., Tucson, AZ (United States). Dept. of Hydrology and Water Resources); Neuman, S.P.; Rasmussen, T.C.; Guzman, A.; Davidson, G.R.; Lohrstorfer, C.F. Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications; Arizona Univ., Tucson, AZ (United States). Dept. of Hydrology and Water Resources. Aug 1994. 210p. Sponsored by Nuclear Regulatory Commission, Washington, DC (United States). Source: OSTI; NTIS; INIS; GPO.

*The objectives of this contract are to examine hypotheses and conceptual models concerning unsaturated flow and transport through heterogeneous fractured rock and to design and execute confirmatory field and laboratory experiments to test these hypotheses and conceptual models. Important new information is presented such as the application and evaluation of procedures for estimating hydraulic, pneumatic, and solute transport coefficients for a range of thermal regimes. A field heater experiment was designed that focused on identifying the suitability of existing monitoring equipment to obtain required data. A reliable method was developed for conducting and interpreting tests for air permeability using a straddle-packer arrangement. Detailed studies of fracture flow from Queen Creek into the Magina Copper Company ore haulage tunnel have been initiated. These studies will provide data on travel time for transport of water and solute in unsaturated tuff. The collection of rainfall runoff, and infiltration data at two small watersheds at the Apache Leap Tuff Site enabled us to evaluate the quantity and rate of water infiltrating into the subsurface via either fractures or matrix. Characterization methods for hydraulic parameters relevant to Weigh-level waste transport, including fracture apertures, transmissivity, matrix porosity, and fracture wetting front propagation velocities, were developed.

1825 (ORNL–6623/Suppl.) **Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York.** Foley, R.D.; Allred, J.F.; Carrier, R.F. Oak Ridge National Lab., TN (United States). Oct 1994. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002949. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the Office of Naval Reactors through the Office of Remedial Action and Waste Technology, a radiological survey of the Peek Street industrial facility, the adjacent state-owned bike path, and two nearby residential properties was conducted by Oak Ridge National Laboratory (ORNL) in November 1989. The results indicated small isolated areas that exceeded DOE guidelines. These areas totaled approximately 0.2 m^2 of floor area and approximately 3 m^2 of wall area inside the building, and two small areas totaling approximately 5 m^2 outside the building. A small section of one of these areas extended beyond the fence on the east side of the industrial property onto the state-owned property. No residual radioactive material or elevated radiation levels were detected on any portion of the paved section of the bike path or the residential properties adjacent to the site. Because the elevated radiation levels were localized and limited in extent, any credible use scenario, including current use conditions, indicated that no significant radiation exposures would accrue to individuals frequenting the area. Samples were also analyzed for elemental beryllium since that material had formerly been used at the site. In conjunction with the planned remediation at the facility, a supplementary characterization survey was performed to further define the areas containing beryllium in excess of the identified guidelines. Additional radiological characterization of Ra-226, Th-232, and U-238 was also performed in areas that were largely inaccessible prior to the remediation efforts.

1826 (ORNL/TM–12741) **Methodologies for estimating one-time hazardous waste generation for capacity generation for capacity assurance planning.** Tonn, B. (Oak Ridge National Lab., TN (United States)); Hwang, Ho-Ling; Elliot, S.; Peretz, J.; Bohm, R.; Hendrucko, B. Oak Ridge National Lab., TN (United States). Apr 1994. 174p. Sponsored by Environmental Protection Agency, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001871. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains descriptions of methodologies to be used to estimate the one-time generation of hazardous waste associated with five different types of remediation programs: Superfund sites, RCRA Corrective Actions, Federal Facilities, Underground Storage Tanks, and State and Private Programs. Estimates of the amount of hazardous wastes generated from these sources to be shipped off-site to commercial hazardous waste treatment and disposal facilities will be made on a state by state basis for the years 1993, 1999, and 2013. In most cases, estimates will be made for the intervening years, also.

1827 (ORNL/TM–12774) **ELIPGRID-PC: A PC program for calculating hot spot probabilities.** Davidson, J.R. Oak Ridge National Lab., TN (United States). Oct 1994. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95002507. Source: OSTI; NTIS; INIS; GPO Dep.

ELIPGRID-PC, a new personal computer program has been developed to provide easy access to Singer's 1972 ELIPGRID algorithm for hot-spot detection probabilities. Three features of the program are the ability to determine: (1) the grid size required for specified conditions, (2) the smallest hot spot that can be sampled with a given probability, and (3) the approximate grid size resulting from specified conditions and sampling cost. ELIPGRID-PC also provides probability of hit versus cost data for graphing with spreadsheets or graphics software. The program has been successfully tested using Singer's published ELIPGRID results. An apparent error in the original ELIPGRID code has been uncovered and an appropriate modification incorporated into the new program.

1828 (PNL–9963) **Source evaluation report phase 2 investigation: Limited field investigation: Final report: United States Air Force Environmental Restoration Program, Eielson Air Force Base, Alaska.** Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 222p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95002834. Source: OSTI; NTIS; GPO Dep.

This report describes the limited field investigation work done to address issues and answer unresolved questions regarding a collection of potential contaminant sources at Eielson Air Force Base (AFB), near Fairbanks, Alaska. These sources were listed in the Eielson AFB Federal Facility Agreement supporting the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup of the base. The limited field investigation began in 1993 to resolve all remaining technical issues and provide the data and analysis required to evaluate the environmental hazard associated with these sites. The objective of the limited field investigation was to allow the remedial project managers to sort each site into one of three categories: requiring remedial investigation/feasibility study, requiring interim removal action, or requiring no further remedial action.

1829 (PNL–10056) **Eielson Air Force Base operable unit 2 and other areas record of decision.** Lewis, R.E.; Smith, R.M. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95003095. Source: OSTI; NTIS; INIS; GPO Dep.

This decision document presents the selected remedial actions and no action decisions for Operable Unit 2 (OU2) at Eielson Air Force Base (AFB), Alaska, chosen in accordance with state and federal regulations. This document also presents the decision that no further action is required for 21 other source areas at Eielson AFB. This decision is based on the administrative record file for this site. OU2 addresses sites contaminated by leaks and spills of fuels. Soils contaminated with petroleum products occur at or near the source of contamination. Contaminated subsurface soil and groundwater occur in plumes on the top of a shallow groundwater table that fluctuates seasonally. These sites pose a risk to human health and the environment because of ingestion, inhalation, and dermal contact with contaminated groundwater. The purpose of this response is to prevent current or future exposure to the contaminated groundwater, to reduce further contaminant migration into the groundwater, and to remediate groundwater.

1830 (PNL–10094) **Hydrogeology along the southern boundary of the Hanford Site between the Yakima and Columbia Rivers, Washington.** Liikala, T.L. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 312p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95000978. Source: OSTI; NTIS; INIS; GPO Dep.

US Department of Energy (DOE) operations at the Hanford Site, located in southeastern Washington, have generated large volumes of hazardous and radioactive wastes since 1944. Some of the hazardous wastes were discharged to the ground in the 1100 and 3000 Areas, near the city of Richland. The specific waste types and quantities are unknown; however, they probably include battery acid, antifreeze, hydraulic fluids, waste oils, solvents, degreasers, paints, and paint thinners. Between the Yakima and Columbia rivers in support of future hazardous waste site investigations and ground-water and land-use management. The specific objectives were to collect and review existing hydrogeologic data for the study area and establish a water-level monitoring network; describe the regional and study area hydrogeology; develop a hydrogeologic conceptual model of the unconfined ground-water flow system beneath the study area, based on available data; describe the flow characteristics of the unconfined aquifer based on the spatial and temporal distribution of hydraulic head within the aquifer; use the results of this study to delineate additional data needs in support of future Remedial Investigation/Feasibility Studies (RI/FS), Fate and Transport modeling, Baseline Risk Assessments (BRA), and ground-water and land-use management.

1831 (PNL–10182) **Designing an enhanced groundwater sample collection system.** Schalla, R. Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001855. Source: OSTI; NTIS; INIS; GPO Dep.

As part of an ongoing technical support mission to achieve excellence and efficiency in environmental restoration activities at the Laboratory for Energy and Health-Related Research (LEHR), Pacific Northwest Laboratory (PNL) provided guidance on the design and construction of monitoring wells and identified the most suitable type of groundwater sampling pump and accessories for monitoring wells. The goal was to utilize a monitoring well design that would allow for hydrologic testing and reduce turbidity to minimize the impact of sampling. The sampling results of the newly designed monitoring wells were clearly superior to those of the previously installed monitoring wells. The new wells exhibited reduced turbidity, in addition to improved access for instrumentation and hydrologic testing. The variable frequency submersible pump was selected as the best choice for obtaining groundwater samples. The literature references are listed at the end of this report. Despite some initial difficulties, the actual performance of the variable frequency, submersible pump and its accessories was effective in reducing sampling time and labor costs, and its ease of use was preferred over the previously used bladder pumps. The surface seals system, called the Dedicator, proved to be useful accessory to prevent surface contamination while providing easy access for water-level measurements and for connecting the pump. Cost savings resulted from the use of the pre-production pumps (beta units) donated by the manufacturer for the demonstration. However, larger savings resulted from shortened field time due to the ease in using the submersible pumps and the surface seal access system. Proper deployment of the monitoring wells also resulted in cost savings and ensured representative samples.

1832 (PSI–94-11) **Grimsel test site: preparation and performance of migration experiments with radioisotopes of sodium, strontium and iodine.** Eikenberg, J. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)); Hoehn, E.; Fierz, T.; Frick, U. Paul Scherrer Inst. (PSI), Villigen (Switzerland). Sep 1994. 77p. Order Number DE95605966. Source: OSTI; NTIS; INIS.

During 1991 four migration experiments with ^{22}Na (run 50), ^{24}Na (run 48), ^{85}Sr (run 50) and ^{123}I (run 47,49) were carried out in the migration fracture at the Grimsel Test Site (GTS) using a two-well injection -extraction technique (dipole configuration). All tests were accompanied by simultaneous injection of Na-fluorescein (uranine) as a conservative tracer. The dipole flow field was installed between boreholes 86.004 (injection well) and 87.006 (extraction well). The extraction flow rate was always held constant at 150 mL/min, while two different injection flow rates of 50 mL/min (runs 47,48) and 10 mL/min (runs 49, 50) were chosen to vary the flow field geometry. These exercises advance the transport model studies to evaluate important fracture specific parameters. Prior to the field tests with radiotracers of cationic Na^+ and Sr^{2+}, the potential sorption of these elements onto equipment materials such as tubing, pumps, detectors was investigated in the field rock laboratory under identical flow conditions and test arrangements as for the fracture tests. In contrast to Na^+, bivalent Sr^{2+} sorbed strongly, especially onto stainless steel tubing surrounding the NaI scintillation counters used for on-line γ-detection of the radiotracers. To minimize sorption of Sr^{2+} on equipment, all exposed materials were then completely replaced by PRFE (Teflon). Further tests revealed that this material proved to be chemically inert with respect to Na^+

and Sr^{2+}. Calibration of the field data was made by check laboratory analyses of water samples. The detection limits of all tracers were below 0.05 Bp/mL. (author) 38 figs., 13 tabs., refs.

1833 (PSI–94-15) **Modular coupling of transport and chemistry: theory and model applications.** Pfingsten, W. (Paul Scherrer Inst. (PSI), Villigen (Switzerland)). Paul Scherrer Inst. (PSI), Villigen (Switzerland). Jun 1994. 78p. Order Number DE95605967. Source: OSTI; NTIS; INIS.

For the description of complex processes in the near-field of a radioactive waste repository, the coupling of transport and chemistry is necessary. A reason for the relatively minor use of coupled codes in this area is the high amount of computer time and storage capacity necessary for calculations by conventional codes, and lack of available data. The simple application of the sequentially coupled code MCOTAC, which couples one-dimensional advective, dispersive and diffusive transport with chemical equilibrium complexation and precipitation/dissolution reactions in a porous medium, shows some promising features with respect to applicability to relevant problems. Transport, described by a random walk of multi-species particles, and chemical equilibrium calculations are solved separately, coupled only by an exchange term to ensure mass conservation. The modular-structured code was applied to three problems: (a) incongruent dissolution of hydrated silicate gels, (b) dissolution of portlandite and (c) calcite dissolution and hypothetical dolomite precipitation. This allows for a comparison with other codes and their applications. The incongruent dissolution of cement phases, important for degradation of cementitious materials in a repository, can be included in the model without the problems which occur with a directly coupled code. The handling of a sharp multi-mineral front system showed a much faster calculation time compared to a directly coupled code application. Altogether, the results are in good agreement with other code calculations. Hence, the chosen modular concept of MCOTAC is more open to an easy extension of the code to include additional processes like sorption, kinetically controlled processes, transport in two or three spatial dimensions, and adaptation to new developments in computing (hardware and software), an important factor for applicability. (author) figs., tabs., refs.

1834 (SCPRI-RM–4-1994) **Monthly results of measurements; April 1994.** Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France). 1994. 52p. (In French). Order Number DE95605970. Source: OSTI; NTIS (US Sales Only); INIS.

This report of the SCPRI exposes the principal results concerning the routine monitoring of environmental radioactivity in France: atmospheric dusts, rainwater, surface water, underground water, sewage water, drinking water, food chain (milk, vegetables, fishes), sea water around nuclear sites and other sites. The activities of various radioisotopes are presented in tables.

1835 (SCPRI-RM–5-1994) **Monthly results of measurements; May 1994.** Service Central de Protection contre les Rayonnements Ionisants, 78 - Le Vesinet (France). 1994. 52p. (In French). Order Number DE95605971. Source: OSTI; NTIS (US Sales Only); INIS.

This report of the SCPRI exposes the principal results concerning the routine monitoring of environmental radioactivity in France: atmospheric dusts, rainwater, surface water, underground water, sewage water, drinking water, food chain (milk, vegetables, fishes), sea water around nuclear sites and other sites. The activities of various radioisotopes are presented in tables.

1836 (SKB-TR–93-24) **Direct fault dating trials at the Aespoe Hard Rock Laboratory.** Maddock, R.H. (GeoScience Ltd., Ascot (United Kingdom)); Hailwood, E.A.; Rhodes, E.J.; Muir Wood, R. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Oct 1993. 238p. Order Number DE95606011. Source: OSTI; NTIS; INIS.

Over seventy rock samples were collected from fault and fracture zones in the Aespoe Hard Rock Laboratory tunnel for a study of direct fault dating techniques. Following microstructural and mineralogical analysis, isotopic, palaeomagnetic and electron spin resonance (ESR) methods were employed in an attempt to determine the age of the most recent movements on the sampled faults. The larger fracture zones contain faultrock assemblages and microstructures which are consistent with a prolonged and polyphase movement history, although the cumulative displacements involved formation of fault gouge cemented by authigenic 'illite'. Dating studies were targeted particularly at the gouge but also at older fault rock and vein phases. ESR dating of quartz graines, separated from gouge from fracture zones NE-4 and NE-3, strongly indicates that the ESR signals have not been reset by fault movements for a minimum time period of several hundred thousand to one million years. Palaeomagnetic dating of gouge from fracture zone NE-4 shows that a stable component of magnetisation overlaps both Precambrian and Permo-Triassic parts of the apparent polar wander curve. The younger age of magnetisation is preferred on geological grounds and by comparison with the isotopic dating results. The magnetisation may correspond to a diagenetic event following fault movement. Palaeomagnetic ages determined on countryrock and epidote vein samples are largely consistent with independent age constraints. K-Ar dating of clay fractions (<2 to $<0.05\mu m$) separated from gouge from four faults, including fracture zones NE-4 and NE-3, gave model ages in the range 706-301Ma. Accounting for the effects of contamination by potassium-bearing porphyroclasts, it is likely that authigenic 'illite' was formed at least 250 million years ago, after the most recent significant fault movements. 100 refs., 60 figs., 26 tabs.

1837 (SKB-TR–94-05) **Tectonic regimes in the Baltic Shield during the last 1200 Ma - A review.** Larsson, S.Aa. (Chalmers Univ. of Technology, Goeteborg (Sweden). Dept. of Geology); Tullborg, E.L. Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Nov 1993. 85p. Order Number DE95606012. Source: OSTI; NTIS; INIS.

This report is a review about tectonic regimes in the Baltic (Fennoscandian) Shield from the Sveconorwegian (1.2 Ga ago) to the present. It also covers what is known about palaeostress during this period, which was chosen to include both orogenic and anorogenic events. A summery is given in table form, and a lithostratigraphic map of Baltica including adjacent sea areas is enclosed. Plate movements are the ultimate reason for stress build-up in the crust. It is concluded that continental drift and rotation velocity have changed during the Earth's history. Periods of convergence and collision between continents are succeeded by periods of continental break-up. The different stress regimes, which prevailed during fracturing, produced specific fracture patterns on different scales. These fractures were reactivated during later favourable stress regimes. Within the next 100 000 years the stress situation of the Baltica crust will not change, except for the effects imposed by the growth and melting of an ice cover. 214 refs.

1838 (SKB-TR–94-07) **INTRAVAL Working group 2 summary report on Phase 2 analysis of the Finnsjoen test case.** Andersson, Peter (ed.) (Geosigma, Uppsala (Sweden)); Winberg, A. (ed.). Swedish Nuclear Fuel and Waste Management Co., Stockholm (Sweden). Jan 1994. 79p. Order Number DE95606013. Source: OSTI; NTIS; INIS.

A comprehensive series of tracer tests on a relatively large scale have been performed by SKB at Finnsjoen, Sweden, to increase understanding of transport phenomena which govern migration of radionuclides in major fracture zones. The conducted experiments were subsequently selected as a test in the international INTRAVAL Project, in part because the tests at Finnsjoe invite to direct address of validation of geosphere models. This report summarizes the study of the Finnsjoe test case within INTRAVAL Phase 2, which has involved nine project teams from seven countries. Porous media approaches in two dimensions dominated, although some project teams utilized one-dimensional transport models, and even three-dimensional approaches on a larger scale. The dimensionality employed did not appear to be decisive for the ability to reproduce the observed field responses. It was also demonstrated that stochastic approaches can be used in a validation process. Only four out of nine project teams studied more than one process. The general conclusion drawn is that flow and transport in the studied zone is governed by advection and that hydrodynamic dispersion is needed to explain the breakthrough curves. Matrix diffusion is assumed to have small or negligible

effect. The performed analysis is dominated by numerical approaches applied on scales on the order of a 1000m. Taking scale alone into account, the results of most teams are possible to compare. A variety of validation aspects have been considered. Five teams utilized a model calibrated on one test, to predict another, whereas the two teams utilizing stochastic continuum approaches addressed; (1) validity of extrapolation of a model calibrated on one transport scale to a larger scale, (2) performance assessment implications of choice of underlying distribution model for hydraulic conductivity, respectively. 37 refs.

1839 (UCRL-JC–118432) **Fiber-optic sensors for rapid, inexpensive characterization of soil and ground water contamination.** Milanovich, F.P.; Yow, J.L. Jr. Lawrence Livermore National Lab., CA (United States). Aug 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941152–1: Conference and exposition on petroleum hydrocarbons, Houston, TX (United States), 2-4 Nov 1994). Order Number DE95002471. Source: OSTI; NTIS; INIS; GPO Dep.

The extent and complexity of worldwide environmental contamination are great enough that characterization, remediation, and performance monitoring will be extremely costly and lengthy. Characterization techniques that are rapid, inexpensive, and simple and that do not generate waste are urgently needed. Towards this end LLNL is developing a fiber-optic chemical sensor technology for use in groundwater and vadose-zone monitoring. We use a colorimetric detection technique, based on an irreversible chemical reaction between a specific reagent and the target compound. The accuracy and sensitivity of the sensor (<5 ppb by weight in water, determined by comparison with gas chromatographic standard measurements) are sufficient for environmental monitoring of trichloroethylene (TCE) and chloroform.

1840 (USGS-OFR–94-162) **Preliminary surficial geologic map of the Rocky Flats Plant and vicinity, Jefferson and Boulder Counties, Colorado.** Shroba, R.R.; Carrara, P.E. Geological Survey, Denver, CO (United States). 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI34-93RF00674. Order Number DE95003009. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains a 1:6000 scale map of the 3-mile by 4-mile rectangular area surrounding the Rocky Flats Plant. The map shows the surface deposits estimated to be at least one meter thick. The accompanying report contains a detailed description of the map units, a discussion of the Rocky Flats alluvium and landslides, and cited references. 37 references.

1841 (VTT-TIED–1538) **VTT test borehole for bedrock investigations.** Okko, O.; Hassinen, P.; Front, K. Technical Research Centre of Finland, Espoo (Finland). Feb 1994. 41p. Order Number DE95606014. Source: OSTI; NTIS; INIS.

A borehole of depth 150 m and diameter 56 mm has been drilled in the area adjacent to the premises of the Technical Research Centre of Finland (VTT) at Otaniemi, Espoo, for the purposes of calibrating geophysical measurements devices. This report presents the test results obtained so far and illustrates the processing of these, in which the various measurements are plotted as curves and combinations of curves. The interpretations provided so far consists of analyses of lithological variations, bedrock fracturing, the nature and occurrence of fracture zones and groundwater flow patterns. Samples were taken from those parts of the core shown by the borehole measurements to be homogenous and thin sections made from these for mineralogical determinations. The rock mechanical and petrophysical properties of the same points were examined. The core is in the possession of VTT, and the hole itself is available to outsiders for the calibration and testing of borehole measurement equipment. (orig.). (21 refs., 13 figs., 5 tabs.).

1842 (VYH-JULK–A146) **Nationwide rural well water survey: The quality of household water and factors influencing it.** Korkka-Niemi, K.; Sipilae, A.; Hatva, T.; Hiisvirta, L.; Lahti, K.; Alfthan, G. National Board of Waters and Environment, Helsinki (Finland); Ministry of Social Affairs and Health, Helsinki (Finland). 1993. 225p. (In Finnish). Order Number DE95605972. Source: OSTI; NTIS; INIS.

Reports of the Ministry of Social Affairs and Health 2/93.

The quality of water in 1 421 drinking-water wells was monitored in a nationwide well water study. Samples were taken once from all wells, and during three seasons from 421 wells. The wells were selected in such a way that me sample would be as representative as possible of the quality of the drinking-water in households' own wells in rural areas. The study comprised general water quality parameters, influence of sampling season, and factors related to the type, the condition and the pollution of the wells. In part of the well waters selenium, radioactivity and pesticides were determined. The effect of plumbing materials on the quality of water was also examined. (33 refs., 148 figs., 71 tabs.).

1843 (WHC-SA–1937) **Combining innovative technology demonstrations with dense nonaqueous phase liquids cleanup.** Hagood, M.C. (Westinghouse Hanford Co., Richland, WA (United States)); Koegler, K.J.; Rohay, V.J.; Trent, S.J.; Stein, S.L.; Brouns, T.M.; McCabe, G.H.; Tomich, S. Westinghouse Hanford Co., Richland, WA (United States). May 1993. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-930906–21: '93 international conference on nuclear waste management and environmental remediation, Prague (Czech Republic), 5-11 Sep 1993). Order Number DE95001642. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactively contaminated acidic aqueous wastes and organic liquids were discharged to the soil column at three disposal sites within the 200 West Area of the Hanford Site, Washington. As a result, a portion of the underlying groundwater is contaminated with carbon tetrachloride several orders of magnitude above the maximum contaminant level accepted for a drinking water supply. Treatability testing and cleanup actions have been initiated to remove the contamination from both the unsaturated soils to minimize further groundwater contamination and the groundwater itself. To expedite cleanup, innovative technologies for (1) drilling, (2) site characterization, (3) monitoring, (4) well field development, and (5) contaminant treatment are being demonstrated and subsequently used where possible to improve the rates and cost savings associated with the removal of carbon tetrachloride from the soils and groundwater.

5403 Environmental Sciences, Aquatic

Refer also to citation(s) 241, 451, 453, 465, 473, 587, 637, 834, 835, 838, 1036, 1042, 1144, 1312, 1362, 1702, 1703, 1714, 1717, 1726, 1727, 1731, 1754, 1776, 1783, 1793, 1830, 1834, 1835, 1842, 1908

1844 (CONF-9308250–1) **The speciality fertilizer market–scope and issues.** Schmidlkofer, R.M. Tennessee Valley Authority, Muscle Shoals, AL (United States). Aug 1993. 37p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (TVA-Circ.–Z-335). From American Chemical Society national meeting on fertilizer and soil chemistry/specialty fertilizers; Washington, DC (United States); 23-27 Aug 1993. Order Number DE95001726. Source: OSTI; NTIS.

The specialty fertilizer market is a subset of the fertilizer market. The specialty market is characterized by high-value crops, usually with a very limited time between planting and market and subject to price variations due to quality and market timing. Additional characteristics of this market include innovations in development of new products, use of new products, and new developments and modifications in use of older products. Issues affecting this market include concerns associated with excessive nutrient runoff from irrigation. This paper focuses on the scope (including definitions) of the specialty market and issues affecting the industry.

1845 (DOE/ER–0620P) **Ocean Margins Program: Closure on the global carbon cycle: Program description.** Riches, M.R. USDOE Office of Energy Research, Washington, DC (United States). Aug 1994. 23p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018617. Source: OSTI; NTIS; GPO Dep.

The Department of Energy's Ocean Margins Program (OMP) is designed to quantitatively assess the importance of coastal ocean systems in the global carbon cycle. Since the beginning of the

Industrial Revolution, human energy-related activities have dramatically altered the global carbon cycle, and consequently, this cycle is not presently in a steady-state. To reduce major uncertainties in predicting future global environmental quality, it is imperative to understand the sources and sinks of atmospheric CO_2, the role of anthropogenic activities in disrupting the natural carbon cycle, and the effects of, and feedbacks between, these activities and the natural carbon cycle. Due to continuously increased loading of nutrients to the margins, which, globally, is related to the rate of human population growth and high population densities in coastal states, biological carbon fixation has been stimulated. Depending on the fate of the fixed carbon, this stimulation has the potential to mitigate the anthropogenically derived Co_2. Determining the factors that control the magnitude of carbon exchanges between the ocean margins and the atmosphere, and the subsequent fate of this carbon, is crucial to predicting the strength and capacity of the oceans to absorb excess anthropogenic atmospheric CO_2. The goals of the OMP are to: quantify the ecological and biogeochemical processes and mechanisms that define the cycling, flux, and storage of carbon and other biogenic elements at the land/ocean interface; identify how ocean-margin sources and sinks of carbon change in response to human activities; and determine whether continental shelves are quantitatively significant in removing atmospheric carbon dioxide and isolating it via burial in sediments or export to the interior of the open ocean.

1846 (DOE/ER/13614–T1) **Microbiology and physiology of anaerobic fermentations of cellulose: Progress report.** Peck, H.D. Jr.; Ljungdahl, L.G.; Mortenson, L.E.; Wiegel, J.K.W. Georgia Univ., Athens, GA (United States). [1994]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-86ER13614. Order Number DE95002899. Source: OSTI; NTIS; GPO Dep.

This project studies the biochemistry and physiology of four major groups (primary, secondary, ancillary and methane bacteria) of anaerobic bacteria, that are involved in the conversion of cellulose to methane or chemical feedstocks. The primary bacterium, Clostridium thermocellum, has a cellulolytic enzyme system capable of hydrolyzing crystalline cellulose and consists of polypeptide complexes attached to the substrate cellulose with the aid of a low molecular yellow affinity substance (YAS) produced by the bacterium in the presence of cellulose. Properties of the complexes and YAS are studied. Aspects of metabolism are being studied which appear to be relevant for the interactions on consortia and their bioenergetics, particularly related to hydrogen, formate, CO, and CO_2. The roles of metals in the activation of H_2 are being investigated, and genes for the hydrogenases cloned and sequenced to established structural relationships among the hydrogenases. The goals are to understand the roles and regulation of hydrogenases in interspecies H_2 transfer, H_2 cycling and the generation of a proton gradient. The structures of the metal clusters and their role in the metabolism of formate will be investigated with the goal of understanding the function of formate in the total synthesis of acetate from CO_2 and its role in the bioenergetics of these microorganisms. Additionally, the enzyme studies will be performed using thermophiles and also the isolation of some new pertinent species. The project will also include research on the mechanism of extreme thermophily (growth over 70°) in bacteria that grow over a temperature span of 40°C or more. These bacteria exhibit a biphasic growth response to temperature and preliminary evidence suggests that the phenomenon is due to the expression of a new set of enzymes. These initial observations will be extended employing techniques of molecular biology.

1847 (DOE/ER/13614–T2) **Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, April 30, 1991–April 30, 1992.** Peck, H.D. Georgia Univ., Athens, GA (United States). Research Foundation. [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-86ER13614. Order Number DE95002900. Source: OSTI; NTIS; GPO Dep.

This progress report contains three individual project reports. The first, hydrogenase project has as its major goal to develop the basic techniques and information required to apply the methodology of molecular biology to studies of the structure function aspects of hydrogenase. The second looks at efforts to understand the biochemical reactions of the biodegradation of cellulose. The third concerns the genetics and biochemistry of the Azotobacter vinelandII Hoxc DNA region.

1848 (DOE/ER/61578–1, pp. 113-118) **Atlantic interdecadal ocean-atmosphere interaction.** Kushnir, Y. (Columbia Univ., Palisades, NY (United States)). McGill Univ., Montreal, PQ (Canada). Dept. of Atmospheric and Oceanic Sciences. Feb 1994. (CONF-9306361–: 17. Stanstead seminar, Quebec (Canada), 13-18 Jun 1993). In *The role of large-scale, extratropical dynamics in climate change.* 219p. Order Number DE94017651. Source: OSTI; NTIS; INIS; GPO Dep.

We study the climatic scale fluctuation of North Atlantic sea surface temperature (SST), and related atmospheric variability. Time series of North Atlantic SST, based on marine observations, display an almost century long swing from cold condition before 1925 to warm conditions between 1930 and the early 1960s, and back to cold conditions after 1965 or so.

1849 (DOE/ID–22111) **Concentrations of tritium and strontium-90 in water from selected wells at the Idaho National Engineering Laboratory after purging one, two, and three borehole volumes.** Bartholomay, R.C. USDOE Idaho Operations Office, Idaho Falls, ID (United States). 1993. 25p. Sponsored by Department of the Interior, Washington, DC (United States). (USGS/WRI–93-4201). Order Number DE95002017. Source: OSTI; NTIS; INIS; GPO Dep.

Water from 11 wells completed in the Snake River Plain aquifer at the Idaho National Engineering Laboratory was sampled as Part of the US. Geological Survey's quality assurance program to determine the effect of Purging different borehole volumes on tritium and strontium-90 concentrations. Wells were selected for sampling on the basis of the length of time it took to purge a borehole volume of water. Samples were collected after purging one, two, and three borehole volumes. The US Department of Energy's Radiological and Environmental Sciences Laboratory provided analytical services. Statistics were used to determine the reproducibility of analytical results. The comparison between tritium and strontium-90 concentrations after purging one and three borehole volumes and two and three borehole volumes showed that all but two sample pairs with defined numbers were in statistical agreement. Results indicate that concentrations of tritium and strontium-90 are not affected measurably by the number of borehole volumes purged.

1850 (DOE/NV/10162–21) **A two-dimensional simulation of tritium transport in the vadose zone at the Nevada Test site.** Ross, W.C.; Wheatcraft, S.W. Nevada Univ., Las Vegas, NV (United States). Desert Research Inst. Sep 1994. 233p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-81NV10162. Order Number DE95001439. Source: OSTI; NTIS; GPO Dep.

Publication No. 45098.

The site of a 0.75-kiloton underground nuclear explosion, the Cambric event, was selected for the study of radionuclide transport in the hydrologic environment. Water samples from RNM-2S, a well located 91 m from Cambric, have been analyzed for tritium and other radionuclides since the initiation of pumping. Water from RNM-2S flows to Frenchman Lake via an unlined canal. Flume data indicate canal transmission losses of approximately $2m^3$/day/meter of canal. To determine if infiltrating canal water might be recirculated by RNM-2S, and therefore provide an additional radionuclide input to water samples collected at RNM-2S, a two-dimensional variably saturated solute transport computer model (SATURN, Huyakorn et al., 1983) was used to simulate the movement of tritium from the canal to the water table. Results indicate that recirculated canal water has not had a significant effect on the breakthrough of tritium at RNM-2S.

1851 (INIS-mf–14340, pp. 384-402) **Cesium-137 in the marine environment of the gulf of Thailand.** Polphong, P.; Milintawisamai, M.; Panyatipsakul, T. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and*

Technology Conference 1990. Proceedings. Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

The determination of Cs-137 in marine environment has been conducted by collecting surface sea water, sediment and marine biota from five stations in the Gulf of Thailand during 7-15 February 1989. The volume of 50 liters of sea water was precipitated with AMP (Ammonium Phosphomolybdate) and analysed by gamma spectroscopic method using a high purity germanium detector coupled with a set of multi-channel analyzer. The method also used for analysing the Cs-137 activity in dry sediments and marine biota. The results of activity of Cs-137 in surface sea water are in the range of 3.43+-0.3 to 4.24+-0.25 mBq/liter, 0.82+-0.11 to 2.14+-0.12 Bq/kg (dry weight) in sediment and 0.10+-0.15 to 0.61+-0.19 Bq/kg in marine biota. The system was calibrated with standard sources from International Atomic Energy Agency which is traceable to standard of NBS of USA.

1852 (INIS-mf–14340, pp. 403-412) **Carbon-14 in the marine environment of the gulf of Thailand.** Sonsuk, M.; Watthanachai, N. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Carbon-14 in surface sea water, sediment and marine biota collected from the Gulf of Thailand have been determined by using benzene synthesis and liquid scintillation counting. The results for the carbon-14 activity are expressed in Bq g^{-1} carbon and also related to the NBS carbon-14 modern standard in percent modern carbon (pmc). The measured carbon-14 values are in the range 0.25 to 0.28 Bq g^{-1} carbon for surface sea water, 0.24 to 0.25 Bq g^{-1} carbon for marine biota and 0.15 to 0.20 Bq g^{-1} carbon for sediment.

1853 (INIS-mf–15045) **Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals.** Runkel, M. Marburg Univ. (Germany). Fachbereich 15 - Chemie. 16 Dec 1992. 134p. (In German). Order Number DE95711741. Source: OSTI; NTIS (US Sales Only); INIS.

This thesis describes experiments concerning the sorption and desorption of heavy-metal ions at surfaces of sediments in the river Lahn. Various test series in which seven metals or other chemical compounds such as acids, complexing agents and salts are added demonstrate in what way the sorption and desorption of heavy metals can be influenced. From the results, the relative strength of the metal ion/sediment bond is derived for cadmium(II), lead(II), copper(II) and nickel(II) ions. Furthermore, the investigations revealed that the river's sediments have a high capacity for heavy metal uptake, for which the river itself normally has no need. Most of the effects observed become manifest only in the presence of large amounts of metal ions and large amounts of other chemical compounds in the solution. The sorption experiments suggest that ions of different metals are mutually influenced if they are present in the solution in large quantities; in this case the different strength of the bonds between metal ions and sediment becomes particularly evident. On the whole the test series revealed that, out of the metals investigated, lead ions bind most intensely and cadmium ions least intensely to the sediments of the Lahn. (orig.)

1854 (INIS-mf–15061) **Results of the physical-chemical investigations 1992; in tables.** Arbeitsgemeinschaft der Laender zur Reinhaltung der Weser, Bremen (Germany). [1994]. 208p. (In German). Order Number DE95715689. Source: OSTI; NTIS (US Sales Only); INIS.

The ARGE Weser, a cooperative effort of the Laender of Bremen, Hessen, Niedersachsen, Nordrhein-Westfalen and Thueringen for the abatement of pollution in the Weser river, issues a yearly report which contains the results of the water quality monitoring programmes in the Weser and Werra/Ulster rivers. There is an introductory section with a description of the measuring programme, a map containing the measuring points, a sampling schedule, sampling procedures, and the method of analysis. The report addresses scientific/technical services and universities. It permits a parameter-specific assessment of the water quality of the Weser river. (orig./EF)

1855 (INIS-mf–15062) **50th report of the Arbeitsgemeinschaft Rhein-Wasserwerke. Annual report 1993.** Arbeitsgemeinschaft Rhein-Wasserwerke e.V. (ARW), Koeln (Germany). 1994. 229p. (In German). Order Number DE95715691. Source: OSTI; NTIS (US Sales Only); INIS.

This annual report comprises seven sections on specific problems, e.g. sulfonic acid analysis, organic pollutant levels in the Main and Nidda rivers, and the behaviour of selected pesticides during their passage through river bank soil, as well as a section on problems of other rivers, e.g. the Elbe. (orig./EF)

1856 (LA-UR–94-3595) **Radionuclide release rates from spent fuel for performance assessment modeling.** Curtis, D.B. Los Alamos National Lab., NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409212–2: 6. Commission of European Countries (CEC) natural analogue working group meeting, Santa Fe, NM (United States), 12-16 Sep 1994). Order Number DE95002746. Source: OSTI; NTIS; INIS; GPO Dep.

In a scenario of aqueous transport from a high-level radioactive waste repository, the concentration of radionuclides in water in contact with the waste constitutes the source term for transport models, and as such represents a fundamental component of all performance assessment models. Many laboratory experiments have been done to characterize release rates and understand processes influencing radionuclide release rates from irradiated nuclear fuel. Natural analogues of these waste forms have been studied to obtain information regarding the long-term stability of potential waste forms in complex natural systems. This information from diverse sources must be brought together to develop and defend methods used to define source terms for performance assessment models. In this manuscript examples of measures of radionuclide release rates from spent nuclear fuel or analogues of nuclear fuel are presented. Each example represents a very different approach to obtaining a numerical measure and each has its limitations. There is no way to obtain an unambiguous measure of this or any parameter used in performance assessment codes for evaluating the effects of processes operative over many millennia. The examples are intended to suggest by example that in the absence of the ability to evaluate accuracy and precision, consistency of a broadly based set of data can be used as circumstantial evidence to defend the choice of parameters used in performance assessments.

1857 (ORNL/CDIAC–55) **Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21).** Chipman, D.W. (Columbia Univ., Palisades, NY (United States). Lamont-Doherty Earth Observatory); Takahashi, T.; Breger, D.; Sutherland, S.C.; Kozyr, A.; Gaslightwala, A.F. Oak Ridge National Lab., TN (United States). Carbon Dioxide Information Analysis Center; Columbia Univ., Palisades, NY (United States). Lamont-Doherty Earth Observatory. Jul 1994. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (NDP–045). Order Number DE95001873. Source: OSTI; NTIS; GPO Dep.

ESD Publication No. 4282.

This document presents the procedures and methods used to obtain carbon dioxide (CO_2), hydrographic, and chemical data during R/V Meteor Expedition 11/5 in the South Atlantic Ocean, including the Drake Passage; the Northern Weddell Sea; and the Eastern South Atlantic Ocean. This cruise was conducted as part of the World Ocean Circulation Experiment (WOCE). The cruise started from Ushuaia, Argentina, on January 23, 1990, and ended at Capetown, South Africa on March 8, 1990. Samples were collected at 78 stations that covered the Drake Passage; the Northern Weddell Sea; a section along the 58 W parallel; and two segmented S-N sections between the Northern Weddell Sea and Capetown, South Africa. Measurements taken at WOCE sections A-12 and A-21 included pressure, temperature, salinity measured by the Conductivity, Temperature and Depth sensor (CTD); bottle salinity; oxygen; phosphate; nitrate; nitrate; silicate; total carbon concentration (TCO_2); and partial pressure of CO_2 (pCO_2) measured at 20 C. In addition, potential density at 0 decibar (dbar) and

potential temperature were calculated from the measured variables. The TCO_2 concentration in seawater samples was measured using a coulometer with an estimated precision of approximately ± μmol/kg.

1858 (PNL–10093) **Factors affecting the quality of fish caught by Native Americans in the Zone 6 fishery 1991 through 1993.** Abernethy, C.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001312. Source: OSTI; NTIS; GPO Dep.

A program to monitor the salmon and steelhead (Oncorhynchus spp.) fishery in the lower Columbia River (Zone 6 fishery) was initiated in 1991 to respond to questions and comments frequently made by Native Americans at public meetings. Native Americans were concerned that the quality of the Columbia River had deteriorated and that the poor environmental conditions had affected the health and quality of fish they relied on for subsistence, ceremonial, religious, and commercial purposes. They also feared that eating contaminated fish might endanger the health of their children and future generations. Operations at the Hanford Site were listed as one of many causes of the deteriorating environment. Fisheries pathologists concluded that most of the external symptoms on fish were related to bacterial infection of gill net abrasions and pre-spawning trauma, and were not caused by pollution or contamination of the Columbia River. The pathologists also stated that consumption of the fish posed no threat to human consumers.

1859 (STUDSVIK-ES–94-26) **Leakage and accidental releases from Sillamaee waste depository and environmental risk assessment.** Bergstroem, U.; Nordlinder, S.; Aggeryd, I. Studsvik Eco and Safety AB, Nykoeping (Sweden). 1994. 31p. Order Number DE95606021. Source: OSTI; NTIS; INIS.

An environmental risk assessment has been performed for the Sillamaee depository. The object of the study is to illustrate the consequences to man if the hazardous substances contained in the depository reach the sea. Two cases were studied: (1) the environmental impact at present conditions with a relatively low continuous leakage of the elements from the dam, and (2) the impact from a sudden dam collapse. The radiological dose impact on the population in the Baltic Sea area has been calculated for the observed leaking rate. The highest individual dose is less than 1μSv while for the dam collapse the dose will be in the order of 2 μSv and the dominant exposure pathway is via consumption of fish. The collective dose is about 1 manSv (emanating from fish caught in all parts of the Baltic Sea for both cases). Furthermore, the consequences of release of some metals (copper, zinc, niobium and molybdenum) were studied in the case of a dam break. In the Bay of Narva, outside the nearest coast, the additional contribution to the natural concentration in water will be neglectable for zinc and niobium. However, for copper and molybdenum the concentration will rise considerably during the first year. The additional load from the depository will still after 50 years be in the same order as published concentrations in the sea. The intake by man of those metals via fish caught in the Bay of Narva will be well below the limits of intake for zinc and molybdenum, (no recommendation of limits for niobium was found), while the calculated intake of copper from the depository will be in the same order as internationally recommended limits of intake. 34 refs.

1860 (WHC-SD-L045H-PC–001) **300 Area treated effluent disposal facility operating specifications document.** Olander, A.R. Westinghouse Hanford Co., Richland, WA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001559. Source: OSTI; NTIS; INIS; GPO Dep.

These specifications deal with the release of treated water into the Columbia River via the TEDF submerged outfall. Specific limits are set for contaminants to be discharged in NPDES permit WA-002591-7. This section contains the operating ranges that will be used to best meet the permit limits.

1861 (YJT–94-10) **Geochemical modelling of the groundwater at the Olkiluoto site.** Pitkaenen, P. (VTT Community and Infrastructure, Espoo (Finland)); Snellman, M.; Leino-Forsman, H.; Vuorinen, U. Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland). Apr 1994. 97p. Order Number DE95606028. Source: OSTI; NTIS; INIS.

A preliminary model for probable processes responsible for the evolution of the groundwater at the nuclear waste investigation site Olkiluoto (in Finland) is presented. The hydrological data was collected from boreholes drilled down to 1000-m depth into crystalline bedrock. Based on chemical, isotopic, petrographic and hydrological data as well as ion plots and speciation calculations with PHREEQE the thermodynamic controls on the water composition and trends constraining these processes are evaluated. In order to determine the reactions which can explain the changes along the flow path during the evolution of groundwater system and to determine to which extent these reactions take place, mass-balance calculations with the NETPATH program were used. Mass transfer calculations with the EQ6 program were used to test the feasibility of the model derived, to predict reaction paths and composition of equilibrium solutions for the redox reactions. (57 refs., 43 figs., 10 tabs.).

55 BIOMEDICAL SCIENCES, BASIC STUDIES

5501 Behavioral Biology

1862 (DOE/ER/60886–T3) **Development of paradigms for the dynamics of structured populations.** California Univ., Davis, CA (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-89ER60886. Order Number DE95001203. Source: OSTI; NTIS; GPO Dep.

This is a technical progress report on the dynamics of predator-prey systems in a patchy environment. A new phenomenon that might contribute to outbreaks in systems of discrete patches has been determined using a discrete time model with both spatial and age structure. A model for a single species in a patchy environment with migration, local population growth and disasters with in patches has been formulated and a brief description is included.

5502 Biochemistry

Refer also to citation(s) 1295, 1327, 1328, 1846, 1847, 1874, 1894, 1948

1863 (ANL/MCS/PP–73221) **A definition of the domains Archaea, Bacteria and Eucarya in terms of small subunit ribosomal RNA characteristics.** Winker, S. (Argonne National Lab., IL (United States). Mathematics and Computer Science Div.); Woese, C.R. Argonne National Lab., IL (United States). Mathematics and Computer Science Div. [1994]. 21p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant NSG-7044. Order Number DE95002924. Source: OSTI; NTIS; GPO Dep.

The number of small subunit rRNA sequences is not great enough that the three domains Archaea, Bacteria, and Eucarya (Woese, et al., 1990) can be reliably defined in terms of their sequence "signatures." Approximately 50 homologous positions (or nucleotide pairs) in the small subunit rRNA characterized and distinguish among the three. In addition, the three can be recognized by a variety of nonhomologous rRNA characters, either individual positions and/or higher-order structural features. The Crenarchaeota and the Euryarchaeota, the two archaeal kingdoms, can also be defined and distinguished by their characteristic composition at approximately fifteen positions in the small subunit rRNA molecule.

1864 (DOE/ER/61640–T1) **Construction of an integrated database to support genomic sequence analysis.** Gilbert, W.; Overbeek, R. Harvard Univ., Cambridge, MA (United States). [1994]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER61640. Order Number DE95001910. Source: OSTI; NTIS; GPO Dep.

The central goal of this project is to develop an integrated database to support comparative analysis of genomes including DNA

sequence data, protein sequence data, gene expression data and metabolism data. In developing the logic-based system GenoBase, a broader integration of available data was achieved due to assistance from collaborators. Current goals are to easily include new forms of data as they become available and to easily navigate through the ensemble of objects described within the database. This report comments on progress made in these areas.

1865 (IS-T–1710) **Development of novel separation techniques for biological samples in capillary electrophoresis.** Chang, H.T. Iowa State Univ. of Science and Technology, Ames, IA (United States). 27 Jul 1994. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001672. Source: OSTI; NTIS; GPO Dep.

This dissertation includes three different topics: general introduction of capillary electrophoresis (CE); gradient in CE and CE in biological separations; and capillary gel electrophoresis (CGE) for DNA separation. Factors such as temperature, viscosity, pH, and the surface of capillary walls affecting the separation performance are demonstrated. A pH gradient between 3.0 and 5.2 is useful to improve the resolution among eight different organic acids. A flow gradient due to the change in the concentration of surfactant, which is able to coat to the capillary wall to change the flow rate and its direction, is also shown as a good way to improve the resolution for organic compounds. A temperature gradient caused by joule heat is shown by voltage programming to enhance the resolution and shorten the separation time for several phenolic compounds. The author also shows that self-regulating dynamic control of electroosmotic flow in CE by simply running separation in different concentrations of surfactant has less matrix effect on the separation performance. One of the most important demonstrations in this dissertation is that the author proposes on-column reaction which gives several advantages including the use of a small amount of sample, low risk of contamination, and time saving and kinetic features. The author uses this idea with laser induced fluorescence (LIF) as a detection mode to detect an on-column digestion of sub-ng of protein. This technique also is applied to single cell analysis in the group.

1866 (LA-SUB–94-163) **Transformation-associated recombination between diverged and homologous DNA repeats is induced by strand breaks.** Larionov, V. (National Institute of Environmental Health Sciences (NIH), Research Triangle Park, NC (United States)); Kouprina, N.; Eldarov, M.; Perkins, E.; Porter, G. National Inst. of Environmental Health Sciences, Research Triangle Park, NC (United States). Lab. of Molecular Genetics. [1994]. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI32-91AL72730. Order Number DE95001743. Source: OSTI; NTIS; GPO Dep.

Rearrangement and deletion within plasmid DNA is commonly observed during transformation. We have examined the mechanisms of transformation-associated recombination in the yeast Saccharomyces cerevisiae using a plasmid system which allowed the effects of physical state and/or extent of homology on recombination to be studied. The plasmid contains homologous or diverged (19%) DNA repeats separated by a genetically detectable color marker. Recombination during transformation for covalently closed circular plasmids was over 100-fold more frequent than during mitotic-growth. The frequency of recombination is partly dependent on the method of transformation In that procedures involving lithium acetate or spheroplasting yield higher frequencies than electroporation. When present in the repeats, unique single-strand breaks that are ligatable, as well as double-strand breaks, lead to high levels of recombination between diverged and identical repeats. The transformation-associated recombination between repeat DNA's is under the influence of the RAD52, RAD1 and the RNC1 genes.

1867 (LA-UR–94-3138) **Multi-basin dynamics of a protein in aqueous solution.** Garcia, A.E. (Los Alamos National Lab., NM (United States). Theoretical Biology and Biophysics Group). Los Alamos National Lab., NM (United States). [1994]. 19p. DOE Contract W-7405-ENG-36. (CONF-9405240–1: Non-linear exitations in biomolecules, Houches (France), 30 May - 4 jun 1994). Order Number DE95000860. Source: OSTI; NTIS; GPO Dep.

A molecular dynamics simulation of crambin in aqueous solution shows that motions are characteristic of non-linear systems. The authors describe typical non-linear excitations, such as intermittency, for various representations of the protein dynamics and structure. The protein backbone dihedral angles show fast correlated transitions from one minimum well to another. Each transition is followed by small overdamped oscillations. Equal-time cross correlations of all (ϕ,ψ) angles show that correlations are extended along the backbone chain. An analysis based on a generalized least squares fitting of the protein fluctuations along vectors show that a small set of molecule optimal dynamic coordinates (MODC) describe most of the protein fluctuations. In addition, the MODC describe a trajectory where the protein conformation jumps from one minimum well to another. An extension of the MODC describing 2- and 3-dimensional cuts of the protein configurational space clearly shows a trajectory around multiple basins of attraction.

1868 (LA-UR–94-3139) **Potential-of-mean-force description of ionic interactions and structural hydration in biomolecular systems.** Hummer, G. (Los Alamos National Lab., NM (United States). Theoretical Biology and Biophysics Group); Garcia, A.E.; Soumpasis, D.M. Los Alamos National Lab., NM (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9405240–2: Non-linear exitations in biomolecules, Houches (France), 30 May - 4 jun 1994). Order Number DE95000859. Source: OSTI; NTIS; GPO Dep.

To understand the functioning of living organisms on a molecular level, it is crucial to dissect the intricate interplay of the immense number of biological molecules. Most of the biochemical processes in cells occur in a liquid environment formed mainly by water and ions. This solvent environment plays an important role in biological systems. The potential-of-mean-force (PMF) formalism attempts to describe quantitatively the interactions of the solvent with biological macromolecules on the basis of an approximate statistical-mechanical representation. At its current status of development, it deals with ionic effects on the biomolecular structure and with the structural hydration of biomolecules. The underlying idea of the PMF formalism is to identify the dominant sources of interactions and incorporate these interactions into the theoretical formalism using PMF's (or particle correlation functions) extracted from bulk-liquid systems. In the following, the authors shall briefly outline the statistical-mechanical foundation of the PMF formalism and introduce the PMF expansion formalism, which is intimately linked to superposition approximations for higher-order particle correlation functions. The authors shall then sketch applications, which describe the effects of the ionic environment on nucleic-acid structure. Finally, the authors shall present the more recent extension of the PMF idea to describe quantitatively the structural hydration of biomolecules. Results for the interface of ice and water and for the hydration of deoxyribonucleic acid (DNA) will be discussed.

1869 (LA-UR–94-3160) **Solution structure analysis of the conformational changes that occur upon the binding of the protein kinase inhibitor peptide to the catalytic subunit of the cAMP dependent protein kinase.** Mitchell, R.D. (Univ. of California, Los Angeles, CA (United States). Dept. of Biological Chemistry); Walsh, D.A.; Olah, G.A.; Sosnick, T.R.; Trewhella, J. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by National Science Foundation, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9404216–1: 21. annual National Organization for the Professional Advancement of Black Chemists and Chemical Engineering meeting, Atlantic City, NJ (United States), 5 Apr 1994). Order Number DE95001021. Source: OSTI; NTIS; GPO Dep.

Fourier transform infrared (FTIR) spectroscopy and small-angle x-ray scattering experiments have been used to examine both the secondary structure content and overall conformation, respectively, of the catalytic subunit of the cAMP-dependent protein kinase and to characterize the structural change that occurs upon binding of the protein kinase inhibitor peptide, PKI(5-22)amide. While the secondary structure of the enzyme is unaltered by the binding of PKI(5-22)amide, a large overall conformational change occurs resulting in a compaction of the enzyme that is characterized by a 2Å decrease in radius of gyration, Rg, and an 11Å decrease in the maximum linear dimension, d_{max}. We have modeled the conformational change as a simple rotation of the upper and lower lobes of

the kinase by 39° about a molecular hinge defined by Glyl25, resulting in a closure of the cleft between the two lobes of the kinase. These data are evaluated with respect to recent x-ray crystallographic studies of the cAMP-dependent protein kinase, CDK2 protein kinase, and the MAP kinase ERK2. In addition, the implications that these findings have for the remainder of the protein kinase family are discussed.

5503 Cytology

Refer also to citation(s) 1892

5504 Genetics

Refer also to citation(s) 1866, 1895

5505 Metabolism

1870 (TVA/NFERC–93/7) **Nitrogen accumulation profiles of selected grain and vegetable crops: A bibliography (1940-1992).** Meischen, S.J.; Byrd, K.R. National Fertilizer and Environmental Research Center, Muscle Shoals, AL (United States). [1994]. 14p. Sponsored by Tennessee Valley Authority, Knoxville, TN (United States). (BULLETIN/Y–233). Order Number DE95001586. Source: OSTI; NTIS.

A bibliography of nitrogen accumulation profile data for 25 vegetable and grain crops reported between 1940 and 1992 is presented. The selected crops are asparagus, broccoli, brussels sprouts, cabbage, carrots, cauliflower, celery, corn, cotton, cucumber, field bean, field pea, garlic, lettuce, onions, and peppers.

5506 Medicine

Refer also to citation(s) 587, 932, 1944

1871 (ANL/TD/CP–82768) **Design of neutron beams at the Argonne Continuous Wave Linac (ACWL) for boron neutron capture therapy and neutron radiography.** Zhou, X.L. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Nuclear Engineering); McMichael, G.E. Argonne National Lab., Idaho Falls, ID (United States). Technology Development Div. [1994]. 14p. Sponsored by Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940976–1: 1. International workshop on accelerator-based neutron sources for boron neutron capture therapy, Jackson, WY (United States), 11-14 Sep 1994). Order Number DE95001445. Source: OSTI; NTIS; INIS; GPO Dep.

Neutron beams are designed for capture therapy based on p-Li and p-Sc reactions using the Argonne Continuous Wave Linac (ACWL). The p-Li beam will provide a 2.5×10^9 n/cm^{2}s epithermal flux with 7×10^5 γ/cm^{2}s contamination. On a human brain phantom, this beam allows an advantage depth (AD) of 10 cm, an advantage depth dose rate (ADDR) of 78 cGy/min and an advantage ratio (AR) of 3.2. The p-Sc beam offers 5.9×10^7 n/cm^{2}s and a dose performance of AD = 8 cm and AR = 3.5, suggesting the potential of near-threshold (p,n) reactions such as the p-Li reaction at E_p = 1.92 MeV. A thermal radiography beam could also be obtained from ACWL.

1872 (BNL–60834) **Transvenous coronary angiography in humans with synchrotron radiation.** Thomlinson, W. Brookhaven National Lab., Upton, NY (United States). [1994]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9407136–1: School of physics: Enrico Fermi, Varenna (Italy), 12-22 Jul 1994). Order Number DE95000762. Source: OSTI; NTIS; INIS; GPO Dep.

The transvenous coronary angiography project at the National Synchrotron Light Source (NSLS) is presently undergoing a significant upgrade to the hardware and software in the synchrotron medical facility. When completed, the project will have reached a level of maturity in the imaging technology which will allow the research team to begin to concentrate on medical research programs. This paper will review the status of the project and imaging technology and will discuss the current upgrades and future advanced technology initiatives. The advantages of using the radiation from a synchrotron, over that from a standard x-ray source, were the motivation for the project. A total of 23 human imaging sessions have been carried out with in the project. The primary goals have been to establish the imaging parameters and protocol necessary to obtain clinically useful images.

1873 (DOE/ER/60639–6) **Radiopharmaceuticals for diagnosis: Final report.** Michigan Univ., Ann Arbor, MI (United States). Mar 1994. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER60639. Order Number DE95002200. Source: OSTI; NTIS; GPO Dep.

In the period 1969-1986, this project was directed to the evolution of target-specific labeled chemicals useful for nuclear medical imaging, especially radioactive indicators suited to tracing adrenal functions and localizing tumors in the neuroendocrine system. Since 1986, this project research has focused on the chemistry of positron emission tomography (PET) ligands. This project has involved the evaluation of methods for radiochemical syntheses with fluorine-18, as well as the development and preliminary evaluation of new radiopharmaceuticals for positron emission tomography. In the radiochemistry area, the ability to predict fluorine-18 labeling yields for aromatic substitution reactions through the use of carbon-13 NMR analysis was studied. Radiochemical yields can be predicted for some structurally analogous aromatic compounds, but this correlation could not be generally applied to aromatic substrates for this reaction, particularly with changes in ring substituents or leaving groups. Importantly, certain aryl ring substituents, particularly methyl groups, appeared to have a negative effect on fluorination reactions. These observations are important in the future design of syntheses of complicated organic radiopharmaceuticals. In the radiopharmaceutical area, this project has supported the development of a new class of radiopharmaceuticals based on the monoamine vesicular uptake systems. The new radioligands, based on the tetrabenazine structure, offer a new approach to the quantification of monoaminergic neurons in the brain. Preliminary primate imaging studies support further development of these radioligands for PET studies in humans. If successful, such radiopharmaceuticals will find application in studies of the causes and treatment of neurodegenerative disorders such as Parkinson's disease.

1874 (EGG–2738) **INEL BNCT Research Program Annual Report 1993.** Venhuizen, J.R. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1994. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002040. Source: OSTI; NTIS; GPO Dep.

This report is a summary of the progress and research produced for the Idaho National Engineering Laboratory Boron Neutron Capture Therapy Research Program for calendar year 1993. Contributions from all the principal investigators are included, covering chemistry (pituitary tumor studies, boron drug development including liposomes, lipoproteins, and carboranylalanine derivatives), pharmacology (murine screenings, toxicity testing, boron drug analysis), physics (radiation dosimetry software, neutron beam and filter design, neutron beam measurement dosimetry), and radiation biology (tissue and efficacy studies of small and large animal models). Information on the potential toxicity of borocaptate sodium and boronophenylalanine is presented. Results of 21 spontaneous-tumor-bearing dogs that have been treated with boron neutron capture therapy at the Brookhaven National Laboratory are updated. Boron-containing drug purity verification is discussed in some detail. Advances in magnetic resonance imaging of boron in vivo are discussed. Several boron-carrying drugs exhibiting good tumor uptake are described. Significant progress in the potential of treating pituitary tumors is presented. Measurement of the epithermal-neutron flux of the Petten (The Netherlands) High Flux Reactor beam (HFB11B), and comparison to predictions are shown.

1875 (INIS-BR–3433) **Importance of the use of gadolinium in neurocysticercosis diagnosis.** Machado Junior, M.A.; Costa, G.; Barbosa, V.A.; Rubin, J.C. Fundacao Monte Tabor, Salvador,

BA (Brazil). Hospital Sao Rafael. [1994]. 14p. (In Portuguese). Order Number DE95603767. Source: OSTI; NTIS (US Sales Only); INIS.

Magnetic Resonance (MRI) and Computed Tomography (CT) features of neurocysticercosis are variable and depend fundamentally on the stage in evolution of the infection, location, number and size of the cysts. The authors retrospectively evaluated MRI obtained on O.5 Tesla superconducting unit in four neurocysticercosis patients and observed new MRI features only after Gadolinium enhancement. (author).

1876 (INIS-BR–3434) **Migrational disorders: a review of 13 cases. Computed tomography and Magnetic resonance imaging.** Machado Junior, M.A.; Barbosa, V.A.; Puglio, N.; Bastos, C.A. Fundacao Monte Tabor, Salvador, BA (Brazil). Hospital Sao Rafael. [1994]. 13p. (In Portuguese). Order Number DE95603768. Source: OSTI; NTIS (US Sales Only); INIS.

The authors reviewed 13 cases of migrational disorders using Computed Tomography (CT) and Magnetic Resonance Imaging (MRI). They found a large advantage of MRI in relation to CT, mainly, to study Schizencephaly, because MRI is more efficient way to demonstrate that the margins of the clefts are lined by cortical and make reliable differentiation with Porencephalic cysts. The relationship of the pathological anatomy to theories of pathogenesis is emphasized. No abnormal findings was detected in the process of Myelinization. (author).

1877 (INIS-BR–3435) **Tomographic criteria of gliomas in the brain stem in infants.** Machado Junior, M.A.; Bracchi, M.; D'Incerti, L.; Passerini, A. Fundacao Monte Tabor, Salvador, BA (Brazil). Hospital Sao Rafael. [1994]. 10p. (In Portuguese). Order Number DE95603769. Source: OSTI; NTIS (US Sales Only); INIS.

The relationship between Computed Tomography Imaging, histopathological and prognostic data is evaluated by reviewing 37 cases of brain stem neoplasm in infants. The results indicate a presence of a cystic lesion with solid mural nodule as the single prognostic criteria of a greater survival rate. Such finding frequently corresponds to Pilocytic Astrocytomas. No correlations between contrast enhancement and prognostic was found. The association between the prognostic value to the densitometric characteristics of the lesions was not possible. It was concluded that the evaluations of the extension of such lesion is fundamental. Therefore, Magnetic Resonance Imaging has more value than computed tomography. (M.A.C.).

1878 (INIS-JP–024, pp. A820/1-A820/14) **Today and tomorrow of intravenous coronary angiography programme in Japan.** Ando, Masami (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Hyodo, Kazuyuki. Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Development of an intravenous coronary angiography system using monochromated synchrotron radiation at the Photon Factory is described. This comprises an asymmetric cut silicon monochromator crystal to get a larger exposure area, a two dimensional imaging system using an imaging intensifier coupled to a CCD TV camera and a fast video data acquisition system. The whole system is under development using alive dogs. A future system including a dedicated insertion device applicable to alive humans is also proposed. (author).

1879 (INIS-JP–024, pp. B742/1-B742/11) **Neutron therapy and medical therapy reactor.** Watarumi, Chikae (Mitsubishi Atomic Power Industries, Inc., Tokyo (Japan)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

A design study for medical reactor for Boron Neutron Capture Therapy (BNCT) has been carried out since 1988, with the cooperation of Kobe Univ. and Mitsubishi Heavy Industries Ltd. The intention of this study is to investigate reactor concepts suitable for BNCT and to decide the major specifications of the reactor which is to be used exclusively for the treatment of cancer and for biomedical research. At present, clinical treatment with BNCT is being carried out only in Japan and good results have been achieved by single radiation regimen using currently available research reactor such as the Musashi Reactor, KUR and JRR-2. However these research reactors are not convenient for the treatment because of the difficulty in scheduling due to other researcher uses. On the other hand, in Europe, USA and Australia, BNCT by epithermal neutrons is being studied because this method makes it possible to treat various deep-seated cancers without surgery. In this case, it is important and necessary to sufficiently suppress the fast neutron contamination in the therapeutic neutron beam. Considering these points, the basic design requirements for the medical reactor have been set as follows in this study. (1) The reactor is to be used exclusively for medical purpose. (2) The reactor is to be capable of treating or diagnosing 50,000 patients during its design life without refueling. (3) The thermal power is to be less than 2MW. (4) The core is to be cooled by natural convection. (5) Separate thermal and epithermal neutron beam holes are to be provided. (6) No heavy water is to be used in the core. (7) Proven technologies are to be utilized. The design concept of the reactor facilities has been defined successfully using semitight hexagonal lattice with low enrichment UO_2 fuel rods of the type used incurrent PWRs and a pool type design. (author).

1880 (INIS-mf–13867) **Nuclear medicine. Czech special bulletin. No. 2.** Fakultni Nemocnice, Plzen (Czech Republic). Sep 1991. 32p. (In Czech). Order Number DE95603340. Source: OSTI; NTIS (US Sales Only); INIS.

The bulletin contains the article on the first experience with the CERTEC preparation in examination of brain perfusion and the article on the potential for the development and manufacture of radiopharmaceutical kits. Both articles are inputted into INIS. (J.B.).

1881 (INIS-mf–14340, pp. 1-22) **Optimized nuclear techniques and survey of neonatal chemical hypothyroidism in iodine deficient areas in Thailand - a preliminary report.** Pleehachinda, R. (Siriraj Hospital Medical School, Bangkok (Thailand). Section of Nuclear Medicine); Pattanachak, C.; Chongchirasiri, C.; Boonamsiri, V.; Pattanachak, S.; Tojinda, N.; Santikijrungruang, C.; Suwanik, R.; Supalek, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Research contract no: Thailand 302-EL-THA-5320.

Seven cases of a total 2,253 cord blood samples (x 0.31% and a range of 0.18-1.6%) from 28 district hospitals in northern provinces were identified as neonatal chemical hypo thyroids (NCH) in 1988-1989. The serum samples were assayed by in-house methods using charcoal RIA of T_4 and bulk reagents (NETRIA) IRMA of TSH. The two-tiered approach after Mitchell and Larsen gave 23 cases of low T_4 and 19 cases of high TSH values. Repeated TSH confirmed the previous results. Using FT_4 for the classification of congenital hypo thyroids, of the final 7 cases only 3 showed straight forward low T_4 and high TSH; the remaining 2 showed low T_4 plus BDL and normal TSH, and, 2 more showed high TSH and BDL T_4. Since assay of T_4 in all cases and TSH in selected cases in such approach cannot give comparison between the assay methods, it has been decided to do T_4 and TSH in all cases. Cases with abnormal and BDL values would be finalized by FT_4. By this way, it is planned that the techniques for serum and blood spots would be further investigated in 1989-1990.

1882 (INIS-mf–14340, pp. 23-34) **TSH IRMA of dried blood spots.** Tojinda, N. (Siriraj Hospital Medical School, Bangkok (Thailand). Section of Nuclear Medicine); Pattanachak, C.; Chongchirasiri, S.; Pattanachak, S.; Putrasreni, N.; Pleehachinda,

R.; Suwanik, R. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

TSH determination is most useful for screening of neonatal hypothyroid in the population in iodine deficient areas. The NETRIA IRMA method for serum TSH was applied for blood-spot TSH. Cord blood on SS No. 903 filter paper was left dry overnight. The spot of 6 mm diameter, one/tube, was mixed with an assay buffer, diluted labelled m-anti-TSH, and diluted anti-TSH-solid phase. The mixture was rotated for 22-24 hours. After washing twice with wash buffer, it was counted for 1 minute. The standard curve with 0, 5, 10, 25, 50, 100, and 150 mIU/L whole blood was obtained with the maximum binding of 25%. The precision profile was satisfactory with %CV of <10 through the range of 10-150 mIU/L. The sensitivity (MDC) was good being 1.65 mIU/L as calculated by mean + 2.5SD. The precision yielded %CV of 6.15, 6.25, and 6.80 for low, medium, and high for an intra-assay and %CV of 7.15, 6.35, and 6.58, respectively for an inter-assay. The blood spots showed the stability of at least 4 months when they were kept at room temperature (30^0C) or 4^0 C or -20^0C. The correlation between serum and blood-spot TSH values (n=120) showed r of 0.9541 and y=1.6123 (BS-TSH) +1.382. The mean of normal cord blood spot TSH (n=142) was 5.27 mIU/L. The technique was found to be precise, sensitive and easy to perform. Mass screening with this developed method is underway.

1883 (INIS-mf–14340, pp. 43-53) **Application of radioactivity in clinical analysis by radioimmunoassay technique.** Tangvarasittichai, S. (Department Clinical Chemistry, Medical Technology, Mahidol University (Thailand)); Tangvarasittichai, O. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

In application of radio nuclei in clinical analysis it is used as therapeutic and diagnostic techniques. In the diagnostic technique it is used for the hormones and other trace elements determination in the clinical laboratory. This analysis method we called "radioimmunoassay". The principle base on the specific reaction of the antigen antibody to form antigen-antibody complex, in the reaction, the radio nuclei ^{125}I or ^{131}I labelled on the antigen and the antigen of sample will be competitive to the binding site of the specific antibody. In the equilibrium time to separate the free form (Ag) and bound form (Ag-Ab, Ag-Ab). Then count the radioactivity by the gamma counter. The quantity of the competition between antigen labelled and antigen in sample with antibody can be calculated by being compared with the result from the standard antigen in known series concentration (as standard curve). The development of the iodination and preparation of the antigen and antibody to improve the RIA technique to determine several diseases such as tumour associated antigens, coagulation factors, prothrombin, hormone (peptide hormone, steroid hormone, thyroid hormone etc.) and concentration of drug in blood.

1884 (INIS-mf–14392, pp. 17-27) **Nuclear energy and the natural environment.** Blix, H. (International Atomic Energy Agency, Vienna (Austria)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

Economical, social, biological and medical aspects of the influence of nuclear energetics on the environment has been discussed. It was been shown that the nuclear techniques can be have a positive contribution to protection the environment proposing more "clean" technology than the classic ones. Many nuclear techniques directly save environmental protection. Among them the agricultural research for optimizing the fertilizer use, new strains of seeds created through radiation induced mutations, measurements of water pollution sources and transport, flue gas radiation processing, food preservation by radiation has been mentioned. The world energy demand will continue to grow. This has negative consequences on the environment. Arising problems will be difficult to solve without a serious development of atomic energetics in the near future.

1885 (INIS-mf–14392, pp. 41-43) **The application of nuclear technology in cancer radiotherapy.** Hliniak, A. (Centre of Oncology, Inst. of M. Sklodowska-Curie, Warsaw (Poland)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The application of nuclear technology in cancer radiotherapy and their fast development after the second world war has been presented. Nowadays the cabaltotherapy is being replaced by linear accelerators due to their better parameters. The ^{131}I and high-LET radiations and fast electrons use for diagnostic and therapeutic purposes has also been shown and discussed.

1886 (INIS-mf–14392, pp. 193-198) **Radiation and health.** Linecki, J. (Akademia Medyczna, Lodz (Poland)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The basic chemical, physical and medico-biological factors governed the interaction of ionizing radiation with the "living-matter" has been defined and systematized. Especially factors important for radiological protection and risk estimation for health of people being exposed to ionizing radiation have been pointed out.

1887 (INIS-mf–14393, pp. 65-66) **A therapy level α-alanine dosimetry.** Stuglik, Z. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Burlinska, G. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 2 figs. RADIOTHERAPY/chemical dosemeters; RADIOTHERAPY/radiation doses; ALANINES; DOSE-RESPONSE RELATIONSHIPS; ELECTRON SPIN RESONANCE; RADIOTHERAPY

1888 (JINR-E–18-94-112) **Medical facility for radiation therapy with JINR proton phasotron beams.** Abazov, V.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems); Budyashov, Yu.G.; Molokanov, A.G.; Mitsyn, G.V.; Savchenko, O.V.; Zorin, V.P.; Astrakhan, B.V.; Pojdenko, V.K. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 14p. Order Number DE95603780. Source: OSTI; NTIS (US Sales Only); INIS.

The six-compartment clinico physical facility for radiation therapy with heavy charged particles was realized at the JINR phasotron. The clinico physical facility consists of several medical channels: three therapeutic proton beams with energies from 100 to 660 MeV; a negative pion beam with energy up to 80 MeV; a therapeutic neutron beam with the mean energy about 350 MeV, and a therapeutic γ-unit with Co-60 source. 15 refs.; 7 figs.; 1 tab. (author).

1889 (JINR-R–6-94-104) **Astatination of monoclonal antibodies.** Miles, S. (Hungarian Academy of Sciences, Budapest (Hungary). Central Research Inst. for Physics); Szucs, Z.; Vasaros, L.; Norseev, Yu.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 11p. (In Russian). Order Number DE95603766. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Radiokhimiya.

It is shown that astatine oxidized to + 1 oxidation state can form stable complex with diethylene triamine penta acetic acid [DTPA], and astatine can be introduced into monoclonal antibodies using DTPA complexes of astatine. The optimal conditions of astatination are determined. Gel filtration and electromigration experiments show that astatine forms a bond with the biomolecules stable 'in vitro'. Even thiourea, the very strong complex forming agent for astatine, cannot destroy the labelled antibodies, and their immune

activity is reserved without significant change during the synthesis and storage. 28 refs.; 4 figs. (author).

1890 (LBL–35802) **A 2.5 MeV electrostatic quadrupole dc accelerator for BNCT application.** Kwan, J.W.; Anderson, O.A.; Reginato, L.L.; Vella, M.C.; Yu, S.S. Lawrence Berkeley Lab., CA (United States). Sep 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-941129–5: Conference on application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95002342. Source: OSTI; NTIS; INIS; GPO Dep.

A DC electrostatic quadrupole (ESQ) accelerator is capable of producing a 2.5 MeV, 100 mA proton beam for the purpose of generating epithermal neutrons for Boron Neutron Capture Therapy. The ESQ accelerator has a strong transverse field for beam focusing and for suppressing secondary electrons and is therefore suitable for high current use. The ESQ physics is well understood and the remaining challenge ahead is in developing the proper power supply system.

1891 (LUNFD6-NFRF–1005-1-29) **Quantitative in vivo elemental analysis using X-ray fluorescence and scattering techniques. Applications to cadmium, lead and bone mineral.** Nilsson, Ulf. Lund Univ., Malmoe (Sweden). Dept. of Radiation Physics. May 1994. 28p. (LUMEDW-MFMR–1005-1-29.). Order Number DE95601924. Source: OSTI; NTIS; INIS.

The X-ray fluorescence technique for in vivo determination of cadmium concentration in the human body has been considerably improved so that the minimum concentration now is 10 μg/g for a skin-organ distance of 50 mm and a measurement time of 30 minutes. The technique has been used for measurements of cadmium in the kidney cortex of 60 non-occupationally exposed persons, showing twice the concentration (26$\pm$9 μg/g) in a sub-group of frequent tobacco smokers compared with a group of non-smokers (10$\pm$11 μg/g). Concentrations of lead in the skeleton of 112 persons have been measured at three bone sites (finger bone, tibia, heel bone) using in vivo XRF techniques either based on Co-57 or Cd-109 sources. There was a good correlation between lead levels at the three bone sites as well as to cumulative exposure index. However, the association between the amount of chelatable lead and measured bone lead levels was poor. The retention of lead in the skeleton of 14 retired workers, now studied for up to 18 years after retirement, shows a half-time of 16 years. 43 refs.

5507 Microbiology

Refer also to citation(s) 1061

5508 Morphology

1892 (DOE/ER/13425–T2) **The structures and functions of oligosaccharins.** Albersheim, P. Georgia Univ., Athens, GA (United States). Complex Carbohydrate Research Center. Aug 1991. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-85ER13425. Order Number DE95002796. Source: OSTI; NTIS; GPO Dep.

This document contains a summary of proposed research studying the role of oligosaccharins in developmental biology and in plant-microbe interactions. Research is described in the following areas of developmental biology: Use of the tobacco thin-cell-layer explant bioassay to screen for oligosaccharins that are able to regulate growth and morphogenesis; oligosaccharin receptors - searching for the receptor for biologically active alpha-1,4-oligogalacturnoides; molecular biology studies of endopolygalacturonase in tobacco tissues; investigation of membrane responses induced by oligogalacturonides; the effect of structurally defined oligosaccharins on plant gene expression. In the area of plant-microbe interactions research is focused on: do oligosaccharins elicit the hypersensitive resistance response, and the polygalacturonase-inhibitor protein (PGIP).

1893 (DOE/ER/13426–T2) **Structural studies of complex carbohydrates of plant cell walls: Progress report, December 15, 1990–December 14, 1991.** Darvill, A. Georgia Univ., Athens, GA (United States). Complex Carbohydrate Research Center. Aug 1991. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-85ER13426. Order Number DE95002794. Source: OSTI; NTIS; GPO Dep.

This report contains abstracts of papers published or in press reporting work supported by this grant proposal during the past year, given here to describe the progress made in this research project. A selection of titles includes: Oxidation of oligoglycosyl alditols during methylation catalyzed by sodium hydroxide and iodomethane in methyl sulfoxide; Identification of the mass spectra of partially methylated alditol acetates by artificial neural networks; A new undecasaccharide subunit of xyloglucans with two alpha-fucosyl residues; The degree of esterification and points of substitution by O-acetyl and O-(3-Hydroxybutanoyl) groups in the acidic extracellular polusaccharides secreted by Rhizoblum legumonisarum biovars viciae, trifolii, and phaseoli are not related to host range; Preparation and characterization of oligosaccharide elicitors of phytoalexin accumulation; A comparison of the polusaccharides extracted from dried and non-dried wall of suspension-cultured sycamore cells; Characterization of seven xyloglucan oligosaccharides containing from seventeen to twenty gluycosyl residues.

5509 Pathology

Refer also to citation(s) 1369

5530 Agriculture and Food Technology

Refer also to citation(s) 954, 1380, 1884

1894 (DOE/ER/13188–9) **Nitrogen control of chloroplast differentiation.** Schmidt, G.W. Georgia Univ., Athens, GA (United States). Research Foundation. [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-84ER13188. Order Number DE95002797. Source: OSTI; NTIS; GPO Dep.

This project was directed toward understanding how the availability of nitrogen affects the accumulation of chloroplast pigments and proteins that function in energy transduction and carbon metabolism. The availability of this nutrient most pervasively limits plant growth and agricultural productivity but the molecular and physiological consequences of nitrogen-deficiency are poorly understood. The model system for our studies of nitrogen-dependent regulation of chloroplast differentiation is the unicellular green alga Chlamydomonas reinhardtii which is grown phototrophically in a continuous culture system. When 150 μM nitrogen is provided at a dilution rate of 0.25 volumes of the growth medium per day, the cultures are sustained at a density of less than 10^5 cells/ml and chlorophyll deficiency, the classical symptom of nitrogen-deficiency, becomes quite pronounced. We found that there is a concomitant loss of light-harvesting complexes and reduced levels of Photosystem II reaction center complexes while ATP synthetase and Photosystem I reaction centers are maintained at high levels. Moreover, reduced rates of chloroplast protein synthesis are due to differential effects on mRNA translation. In contrast, the deficiency of light-harvesting genes is due to marked reductions of the nuclear-encoded cab mRNAs. Although there is no significant reduction of the amounts of RuBPCase, we also detected substantial changes in the mRNA abundance of the alga's two small subunit genes. All of the effects of nitrogen-limitation are readily reversible: greening of cells is completed within 24 hours after provision of 10 mM ammonium. During this time, the plastid translational constraints are disengaged and progressive changes in the abundance of nuclear transcripts occur, including a transient 30-fold elevation of cab mRNAs.

1895 (ETDE/DE-mf–95716328) **Plant breeding and genetic engineering.** Bundesministerium fuer Forschung und Technologie. Pressedokumentation, v. 31/92. Bundesministerium fuer Forschung und Technologie, Bonn (Germany). 9 Oct 1992. 44p. (In German). Order Number DE95716328. Source: OSTI; NTIS (US Sales Only).

The funding programme "Biotechnical methods of plant breeding" is one where, especially, application-oriented research and development projects are sponsored which aim to translate existing results of scientific work into the practice of plant breeding. An emphasis on the crop plants that are economically relevant for

Germany is indispensable; in the forming sector, these are, for instance: Barley, wheat, rape, potatoes and sugar beets. Special points of emphasis of the funding programme are the development of technical regeneration measures and selection methods, labelling of molecules for genetic properties to enhance selective breeding efficiency, and the use of economically and ecologically important genes in the practice of plant breeding. (orig.)

1896 (INIS-JP–024, pp. A530/1-A530/5) **Experiences in selling irradiated produce at the retail level.** Corrigan, J.P. (Carrot Top, Inc., Northbrook, IL (United States)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

A background discussion of how marketing groups, in particular, the produce industry, presents their product to the consumer and how they deal with the controversial issues. This will contain information about the current '5 A Day' program in the United States contrasted with the issues that are facing the industry. I will begin with the way we approached the introduction of the irradiation process to our customers. We started with an informal survey in our company's newsletter. The findings indicated a high degree of interest and lack of information. In succeeding newsletters we provided as much information as possible; always careful to present both sides of the issue. During this time the questions and comments we received in the store indicated a growing interest. With the news that Vindicator opened in Florida we arranged for and announced the arrival of product, again through our newsletter. I will then discuss the various merchandising efforts we undertook. (Ie., Taste-samplings, Buy one get one free, a wide variety of product, etc.) (author).

1897 (INIS-JP–024, pp. A540/1-A540/11) **Food irradiation in China: With emphasis on market testing and public acceptance.** Zhu Jiang (China National Nuclear Corp. (China). Bureau of International Cooperation). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

In this paper, the author discussed the recent situation of food irradiation in China, its history, facilities, clearance, commercialization, and with emphasis on market testing and public acceptance of irradiated food. (author).

1898 (INIS-JP–024, pp. A550/1-A550/8) **Detection of irradiation treatment of foods.** Hayashi, Toru (National Food Research Inst., Tsukuba, Ibaraki (Japan)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Detection of irradiated foods is important for the regulative authorities, consumers, traders and food industry. Most of the physical, chemical and biological changes in foods caused by irradiation are not unique to radiation treatment nor stable enough to be detected for a long period. International collaboration, however, will result in several reliable methods for detecting irradiated foods. FAO/IAEA is conducting Co-ordinated Research Programme on Analytical Detection Methods for Irradiation Treatment of Foods (ADMIT) from 1990 to 1994. The Community Bureau of Reference of the Commission of the European Communities (BCR) conducts another research project on the identification of irradiated foods. The ADMIT and BCR projects are expected to collaborate each other in order to avoid duplication of effort and ensure comparability of results. The ADMIT has established 8 groups to efficiently carry out collaborative research on each method; 'ESR', 'thermoluminescence', 'volatile hydrocarbon', '2-alkyl-cyclobutanone', 'DNA', 'lipid hydroperoxide', 'physical methods', and 'microbiological and biological methods'. The methods which have been reported to be promising are to be evaluated on an inter-laboratory basis in the projects, and 5 methods have already been subjected to inter-laboratory tests with successful results; 'ESR' for animal and poultry meats containing bones, 'thermoluminescence' for spices and dehydrated vegetables, 'lipid volatile hydrocarbons' and 'cyclobutanone' for animal meats, and 'DEFT/APC(microbiological method)' for spices. Protocols for useful and reliable methods have been prepared and their analytical procedures will be compiled. Germany and UK have officially authorized 'thermoluminescence' as a method to detect irradiated spices. (author).

1899 (INIS-mf–14340, pp. 54-81) **The effects of gamma irradiation on blood and its components.** Thongphasuk, J.; Kaewpila, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Although people belonging to the high-risk categories for infectious diseases have been asked not to donate blood, and donor blood is being tested by the most sensitive methods before distribution, viral hepatitis and acquired immuno deficiency syndrome (AIDS) transmissions by blood transfusion continue to be documented. Transmission may occur by false negative tests and the so-called "window period" of AIDS. The objective of this study was to determine the feasibility of application of gamma radiation sterilization to blood and its components by investigating possible alterations of important components of blood after irradiation. With the doses of 2.5-25 kGray, whole blood (WB) and freeze-dried plasma (FDP) were irradiated at 4 C and fresh frozen plasma (FFP) was irradiated at dry-ice temperature (-78.5C). There was no significant difference in the amount of sugar, protein, albumin and pH in WB, FDP, FFP and sodium, potassium in plasma between non-irradiated and irradiated samples ($p>0.05$). No appreciable difference of coagulation factors in FDP and FFP was noted before and after irradiation. In whole blood, the amount of plasma hemoglobin increased and blood cells decreased. There was an obvious decrease of sodium and increase of potassium in plasma from irradiated whole blood even with 2.5 kGy. The data of this study indicates that application of radiation sterilization to plasma, both freeze-dried and frozen, is possible when the proper conditions are applied. Whole blood, however, needs more data to evaluate this possibility.

1900 (INIS-mf–14340, pp. 117-145) **The use of environmental isotopes in ground water hydrology studies in Thailand.** Buapeng, S. (Department of Mineral Resources, Bangkok (Thailand). Ground Water Div.); Chusanathas, S.; Sungkhaburana, S. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

The use of environmental isotopes in ground water hydrology studies in the Lower Chao Phraya Basin, Thailand has been carried out during the past years. Special research has been concentrated in the Bangkok Metropolitan where extensive exploitation of ground water resulted in drastic lowering piezo metric level, increasing in salinities as well as land subsistence. Upper Chao Phraya and Hat Yai Basin were later included in the same programme. Considerable samples of both ground and surface water samples were collected for isotopic and chemical analysis. Isotopic results of ^{18}O, ^{2}H and C-14 indicate the relative age and origin of ground water in the areas. Flow dynamic, the hydraulic interrelationship between different aquifers and saltwater intrusion were also interpreted.

1901 (INIS-mf–14340, pp. 413-423) **Effects of gamma radiation on fruit fly, Dacus zonatus (Saunders).** Sutantawong, M.

Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

The effects of gamma radiation on egg, larval and pupal stages of fruit fly, Dacus zonatus (Saunders) were studied. The 24-hour-old eggs, 1-2, 1-4, 7-8-day-old larvae and 8-day-old pupae were irradiated at 10-600 Gy with a cobalt-60 source and maintained at 26+1^{0}C, 60-80% RH. The results showed that the LD_{50} for 24-hour-old eggs at 2 days after irradiation was 302 Gy. The dose of 600 Gy caused 100% mortality of eggs and larvae hatching from eggs irradiated at 100 Gy were unable to develop to pupae. The 1-2-day-old larvae irradiated at 150 Gy were unable to form pupae. The dose of 50 Gy prevented adult emergence from irradiated 1-2, 4-5, 7-8-day-old larvae. Probit analyses indicated that radiation dose at 58.35 Gy sterilized 99% D. zonatus (Saunders) male emerged from pupae. In addition, female emerged from pupae irradiated at 30 Gy was unable to lay eggs.

1902 (INIS-mf–14340, pp. 450-461) **Sensory evaluation of irradiated and non-irradiated mungbean during storage.** Kaochoung, P.; Limohpasmanee, W. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

The sensory evaluation of irradiated and non-irradiated mungbean which packed in 73, 94, 103 micron thickness polyethylene (PE) bags and 81 micron thickness polypropylene (PP) bag were tested by taste panel. Colour and odor of ground mungbean and colour, odor, flavour and texture of steamed mungbean were tested. There was no difference between irradiated and non-irradiated mungbean in colour, odor, flavour and texture. The mean colour and odor scores for ground mungbean were different between packing bags after storage for 11, 12 months 3, 4 months, 11 months and 1, 4, 7 months respectively. The mean scores of colour, odor of ground mungbean and colour, odor, flavour, texture of streamed mungbean were found to be within the acceptance on a nine point hadronic scale even after twelve months of storage.

1903 (INIS-mf–14340, pp. 462) **The study of irradiated fish for prevention.** Sornmani, S. (Mahidol Univ., Faculty of Tropical Medicine (Thailand)). Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Published in abstract form only. Published in abstract form only.

The experiment was designed to find the minimal effective dose (MED) of irradiation that can inhibit the maturation of O. viverrini. The parasite life cycle was established and maintained in laboratory and the animal model for bioassay was investigated. Hamster was found to be the appropriate model and was used in all experiments. Pure metacercariae (metacercariae dissected from fish before irradiation) were exposed to 0.1, 0.2, 0.3, and 0.5 kGy. No physical change was observed in the exposed metacercariae. The MED was found to be 0.1 kGy. When whole infected fish was irradiated and metacercariae fed to hamsters, the MED was also 0.1 kGy. However, due to technical error either the irradiation technique or parasitological manipulation, one hamster from each group receiving 0.2 and 0.3 kGy irradiated metacercariae was found to have one adult fluke. This fluke has no significant difference in morphology from that of the control, except the eggs in the uterus and in the master's gall bladders were not well developed. In conclusion, the results suggested that 0.1 kGy appears to be the MED of liver fluke in fish. However, fish irradiation to control liver fluke infection in the rural communities may be difficult since the transmission of this infection is normally from the home-made dish prepared from fresh fish available all water beds.

1904 (INIS-mf–14387, [pp. 1]) **EPR studies of reduced Zn-chlorins and their isotope substituted analogs.** Dzilinski, K. (Politechnika Czestochowska (Poland)); Synyakov, G.N.; Shulga, A.M.; Filatov, I.V.; Gurinovich, G.P. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). 1993. 55p. (CONF-9305384–: 1. International conference of the Polish ESR group, Zakopane (Poland), 31 May - 4 jun 1993). In *Electron spin resonance of radicals and metal complexes.* Order Number DE95605640. Source: OSTI; NTIS; INIS.

Short communication. ELECTRON SPIN RESONANCE/chlorine; MOLECULAR BIOLOGY/biological materials; MOLECULAR BIOLOGY/tracer techniques; CHLORINE; REDOX REACTIONS; ZINC

1905 (INIS-mf–14392, pp. 57-76) **Nuclear techniques in food and agriculture with special reference to environmental protection.** Sigurbjoernsson, B. (Joint FAO/IAEA Div. of Nuclear Techniques in Food and Agriculture, Vienna (Austria)). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The two distinct types of nuclear applications in food and agriculture has been described and discussed their reference to environmental protection. The first is the use of radiation to alter genes of crop plants, to sterilize insects or to kill insects or microbes (e.g. in food preservation process). Second type is the use of isotopic tracers to study plant and their animal nutrition and to trace pesticides and residues in plants, animals, food and the environment. It has been proved that all types on nuclear applications in food and agriculture results in less environmental impact and in less use of chemicals. 15 figs.

56 BIOMEDICAL SCIENCES, APPLIED STUDIES

5601 Radiation Effects

Refer also to citation(s) 241, 453, 486, 515, 543, 832, 834, 943, 958, 961, 1702, 1703, 1769, 1794, 1901

1906 (ANL/EAD/TM–24) **RESRAD benchmarking against six radiation exposure pathway models.** Faillace, E.R.; Cheng, J.J.; Yu, C. Argonne National Lab., IL (United States). Oct 1994. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95003096. Source: OSTI; NTIS; INIS; GPO Dep.

A series of benchmarking runs were conducted so that results obtained with the RESRAD code could be compared against those obtained with six pathway analysis models used to determine the radiation dose to an individual living on a radiologically contaminated site. The RESRAD computer code was benchmarked against five other computer codes - GENII-S, GENII, DECOM, PRESTO-EPA-CPG, and PATHRAE-EPA - and the uncodified methodology presented in the NUREG/CR-5512 report. Estimated doses for the external gamma pathway; the dust inhalation pathway; and the soil, food, and water ingestion pathways were calculated for each methodology by matching, to the extent possible, input parameters such as occupancy, shielding, and consumption factors.

1907 (AREAEE–284) **Parameters affecting the calibration uniformity and traceability of gamma measuring devices.** Youssef, S.K.; Henaish, B.A. Nuclear Research Centre, Inshas (Egypt). 1985. 29p. Order Number DE95606182. Source: OSTI; NTIS (US Sales Only); INIS.

One of the problems which usually defeats the dosimetric evaluations performed by the health and safety experts is the absence of the reproducibility and accuracy of the used measuring devices systems. Furthermore, the traceability of the dose evaluation done by the users themselves are not achieved. Also the uniformity and homogeneity between the various users dosimeters and that available at specified central organization are not maintained. The present manuscript is scoping to deal with such various problems such as: (a) dosimeter accuracy, (b) traceability of the various users dosimeters and measuring devices. This paper also suggests a programme for the minimum facilities which are required for operating a central calibration laboratory. the responsibility of that central

calibration lab., beside the linking chain between the different users and that calibration lab. are stated and discussed in detail. Furthermore, the authors experiences gained in operating the secondary standards calibration laboratory are also reviewed. 2 fig.

1908 (BNWL-SA–3047) **Autoradiographic studies of ^{65}Zn adsorption by periphyton.** Rose, F.L.; Cushing, C.E. Pacific Northwest Lab., Richland, WA (United States). 2 Feb 1970. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001337. Source: OSTI; NTIS; GPO Dep.

This reference contains information which details experiments done at the Hanford Reservation on communities of periphyton. These autoradiographic experiments examined the uptake of radioisotopes and diffusion of radioisotopes in the communities. Arguments were presented discussing the presentation of the results on an areal or gravimetric basis.

1909 (CEA-CONF–11810) **Operational management of very low level radioactive wastes: difficulties to elaborate a regulation device.** Zerbib, J.C. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. Securite, Controle et Environnement. 1994. 12p. (In French). (CONF-931292–: Conference on practical thresholds in radiation protection, Saclay (France), 7-8 Dec 1993). Order Number DE95606174. Source: OSTI; NTIS (US Sales Only); INIS.

In this text we discuss about the boundaries of very low level radioactive wastes and the French legislative texts which do not give limits for mass activities. 1 annexe.

1910 (CONF-9308217–, pp. 9, Paper 6) **Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey.** Ettenhuber, E. Jacobs Engineering Group, Inc., Pasadena, CA (United States). [1993]. From Workshop on uranium production environmental restoration: an exchange between the United States and Germany; Albuquerque, NM (United States); 16-20 Aug 1993. In *Proceedings of Workshop on Uranium Production Environmental Restoration: An exchange between the United States and Germany.* 441p. Order Number DE94008528. Source: OSTI; NTIS; INIS.

The consequences of traditional mining and uranium industry, public concern and the need for decisions on restoration and remediation of radioactive-contaminated sites require systematic investigations and objective evaluations of the existing radiological situation. With this intention a comprehensive Federal project has been lauched to study the contributions of the geologic conditions and mining activities to the radiation exposure of the public. The responsibility for the whole project was delegated to the Federal Office for Radiation Protection (BfS). Topics covered in this paper include: Radiological evaluation and legal basis of the radiological protection for workers and for the public; Radiological protection for workers and the public in case of remedial actions.

1911 (CONF-941017–2) **Time-dependent, low-dose reporting limit for dosimeters that are taken home at the end of the workday.** Sonder, E. Oak Ridge National Lab., TN (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. conference on radiation protection and dosimetry; Orlando, FL (United States); 24-27 Oct 1994. Order Number DE94019147. Source: OSTI; NTIS; INIS; GPO Dep.

In routine personnel dosimetry, it is usual to report doses only where th occupational dose (measured dose with background subtracted) is greater than previously determined reporting limit. The reporting limit, although se administratively, should be justified by an assessment of the errors inherent in th personnel and background dose measurements, and estimates of the probability that a zero exposure will yield a dosimeter response equal to the reporting limit. For background subtraction and reporting limits, it was realized that the source of low-dose uncertainty is very much dependent on whether dosimeters are held in racks at the work site or remain with the employee. The External dosimetry Program for the DOE facilities at Oak Ridge, Tennessee, is operated such that dosimeters are taken home by the employee at the end of each workday. This report is a summary measurements of background radiation in a variety of home locations, and calculations of the effect of the variation of this background on the uncertainty low-level occupational dose and on the reporting level. When dosimeters are stored at a given location (e.g., the facility gate), it theoretically possible to determine the background there to any desired accuracy; the errors in occupational dose are then those due to measurement noise and dosimeter calibration. However, when different dosimeters are stored in different homes, th difference in background between a particular location and the average for a locations appears as an added uncertainty in the occupational dose. Since this difference is not random, but fixed for a given location, the error due to this difference increases linearly with assignment time. From the background measurements, time-dependent values of the standard deviation of occupational do and critical levels are derived and used to define an expression for the reporting limit.

1912 (DOE/ER/60631–13) **Radiation physics, biophysics, and radiation biology: Progress report, December 1, 1993–November 30, 1994.** Hall, E.J.; Zaider, M. Columbia Univ., New York, NY (United States). Center for Radiological Research. May 1994. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER60631. Order Number DE94015657. Source: OSTI; NTIS; INIS; GPO Dep.

Research at the Center for Radiological Research is a blend of physics, chemistry and biology and epitomizes the multidisciplinary approach towards understanding the mechanisms involved in the health problems resulting from human exposure to ionizing radiations. To an increasing extent, the focus of attention is on biochemistry and the application of the techniques of molecular biology to the problems of radiation biology. Research highlights from the past year are briefly described.

1913 (DOE/ER/60631–14) **The Radiological Research Accelerator Facility: Progress report, December 1, 1993–November 30, 1994.** Hall, E.J.; Marino, S.A. Columbia Univ., New York, NY (United States). Center for Radiological Research. Apr 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER60631. Order Number DE94015659. Source: OSTI; NTIS; INIS; GPO Dep.

This document begins with a general description of the facility to include historical and up-to-date aspects of design and operation. A user's guide and a review of research using the facility follows. Next the accelerator utilization and operation and the development of the facilities is given. Personnel currently working at the facility are listed. Lastly, recent publications and literature cited are presented.

1914 (DOE/ER/60675–7) **Molecular mechanisms in radiation damage to DNA: Progress report.** Osman, R. Mount Sinai School of Medicine, New York, NY (United States). Dept. of Physiology and Biophysics. 12 Apr 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-88ER60675. Order Number DE95002946. Source: OSTI; NTIS; GPO Dep.

The objectives of this work are to elucidate the molecular mechanisms that are responsible for radiation-induced DNA damage. The overall goal is to understand the relationship between the chemical and structural changes produced by ionizing radiation in DNA and the resulting impairment of biological function expressed as carcinogenesis or cell death. The studies are based on theoretical explorations of possible mechanisms that link initial radiation damage in the form of base and sugar damage to conformational changes in DNA. These mechanistic explorations should lead to the formulation of testable hypotheses regarding the processes of impairment of regulation of gene expression, alteration in DNA repair, and damage to DNA structure involved in cell death or cancer.

1915 (EGG-RAAM–11376) **Decontamination & Decommissioning Equipment Tracking System (DDETS).** Cook, S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab. Jul 1994. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002004. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.

At the request of the Department of Energy (DOE)(EM-50), the Scientific Computing Unit developed a prototype system to track information and data relevant to equipment and tooling removed during decontamination and decommissioning activities. The DDETS proof-of-concept tracking system utilizes a one-dimensional (1D) and two-dimensional (2D) bar coding technology to retain and track information such as identification number, manufacturer, requisition information, and various contaminant information, etc. The information is encoded in a bar code, printed on a label and can be attached to corresponding equipment. The DDETS was developed using a proven relational database management system which allows the addition, modification, printing, and deletion of data. In addition, communication interfaces with bar code printers and bar code readers were developed. Additional features of the system include: (a) Four different reports available for the user (REAPS, transaction, and two inventory), (b) Remote automated inventory tracking capabilities, (c) Remote automated inventory tracking capability (2D bar codes allow equipment to be scanned/tracked without being linked to the DDETS database), (d) Edit, update, delete, and query capabilities, (e) On-line bar code label printing utility (data from 2D bar codes can be scanned directly into the data base simplifying data entry), and (f) Automated data backup utility. Compatibility with the Reportable Excess Automated Property System (REAPS) to upload data from DDETS is planned.

1916 (INIS-GB–644) **Monitoring programme: Radioactive substances report for 1992.** Department of the Environment, London (United Kingdom). Her Majesty's Inspectorate of Pollution. Jun 1994. [103p.] Order Number DE95606166. Source: OSTI; NTIS (US Sales Only); INIS.

Her Majesty's Inspectorate of Pollution's 1992 report on its programme of monitoring radioactive substances is presented. Site operators' returns are verified and the report provides independent data on the environmental impact of authorized disposal of radioactive wastes. Radiation doses which may have been received by members of the public, fall well below the International Commission for Radiological Protection's (ICRP) recommended annual doses. (UK).

1917 (INIS-JP–024, pp. B730/1-B730/4) **Perspectives of ion beam utilization on plant gene analysis.** Tano, Shigemitsu (Japan Atomic Energy Research Inst., Takasaki, Gunma (Japan). Takasaki Radiation Chemistry Research Establishment). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Accelerated heavy charged particles deposit energy in matter in a way which is fundamentally different from that of conventional ionizing radiations like X-rays or gamma rays. Ionization are formed along a well defined track whose radial extension depends on the particle energy while the ionization is a function of its charge and velocity. If heavy ion traverse biological material, they may deliver local doses which are far in excess of microscopical mean lethal exposures but confined to small volumes. Experimental investigations demonstrate, however, that cells are able to survive the passing even of very heavy particle like uranium ions. They may cause mutations or transformations and eventually give rise to tumor formation. It has also been shown that the action of heavy ions is not necessarily limited to the actual site of the passage but may extend over distances at a micrometer scale leading to the creation of so-called 'microlesions'. Heavy charged particles present thus a fascinating tool for fundamental research in radiation biology linking aspects both of molecular biology and genetics. Heavy charged particles deposit energy in a highly localized manner at dimensions which are comparable to those of essential biomolecules. In this way they are not only able to cause specific damage but they constitute also an interesting tool to explore the mechanisms of interaction between radiations and life. Because the type of energy deposit by heavy ion beam is different from low LET radiations as mentioned above, we can expect to obtain the different types of mutation spectrum and mutation frequency, especially chromosome deficient type mutation which are very useful to analyze the genes in various plants. They thus provide new insight into fundamental aspects which are not only necessary for hazard assessment but also for the understanding of those basic processes which made the formation evolution and maintenance of earth possible. (author).

1918 (INIS-mf–14360) **Nuclear and radiological safety, 1980-1993: International Atomic Energy Agency publications.** International Atomic Energy Agency, Vienna (Austria). Jun 1994. 207p. (SUBJ/CAT–1993/NRS.). Order Number DE95605242. Source: OSTI; NTIS (US Sales Only); INIS.

This document lists all sales publications of the International Atomic Energy Agency dealing with Nuclear Safety, issued during the period 1980-1993. It gives an abstract of these publications along with contents and prices in Austrian Schillings.

1919 (INIS-mf–14393, pp. 61-62) **Calcium antagonist, TMB-8, prevents the induction of adaptive response by hydrogen peroxide in human lymphocytes.** Wojewodzka, M. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Walicka, M.; Szumiel, I. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. KBN Grant No 4.1666.91.01. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 2 figs. LYMPHOCYTES/hydrogen peroxide; X RADIATION/biological radiation effects; DNA; LOW DOSE IRRADIATION; LYMPHOCYTES; MUTAGENESIS

1920 (INIS-mf–14393, pp. 62-63) **Track structure analysis of survival of two mouse lymphoma L5178Y cell strains of different radiation sensitivity.** Waligorski, M.P.R. (Institute of Nuclear Physics, Cracow (Poland)); Kruszewski, M.; Rosiek, O.; Krasavin, E.A.; Ovodkov, I.V. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 5 refs., 1 fig. RADIOSENSITIVITY/biological radiation effects; RADIOSENSITIVITY/lymphomas; DOSE-RESPONSE RELATIONSHIPS; LET; PARTICLE TRACKS; RADIOSENSITIVITY; LYMPHOMAS

1921 (INIS-mf–14393, pp. 63) **Reduced sensitivity to camptothecin of L5178Y sublines is accompanied by diminished DNA damage.** Gradzka, I. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Kowalska-Loth, B.; Staron, K. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 8 refs., 1 fig., 1 tab. RADIOSENSITIVITY/animal cells; RADIOSENSITIVITY/dna; ALKALOIDS; ISOMERASES; LYMPHOMAS; RADIOSENSITIVITY; DNA

1922 (INIS-mf–14393, pp. 64) **Sensitivity to inhibitors of type II topoisomerase from mouse L5178Y lymphoma sublines: Resistant and sensitive to X radiation.** Buraczewska, I. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Szumiel, I.; Kowalska-Loth, B.; Staron, K. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 refs., 1 fig. RADIOSENSITIVITY/animal cells; DNA; ENZYME INHIBITORS; ISOMERASES; LYMPHOMAS; RADIOSENSITIVITY; STRAND BREAKS; X RADIATION

1923 (INIS-mf–14393, pp. 64-65) **Metabolism of arachidonic acid in murine lymphoma L5178Y sublines radiation resistant of sensitive to ionizing radiation.** Sochanowicz, B. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Dancewicz, A.M. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 ref., 3 figs., 1 tab. RADIOSENSITIVITY/animal cells; ARACHIDONIC ACID; CARBON 14; HYDROGEN PEROXIDE; LYMPHOMAS; METABOLISM; RADIOSENSITIVITY

1924 (NEI-NO–431) **Quality control handbook in mammography: Radiation Protection - Booklet 2.** Olerud, H.M.; Widmark, A. Statens Straalevern, Oesteraas (Norway). Jun 1994.

56p. (In Norwegian). Order Number DE95606194. Source: OSTI; NTIS; INIS.

The publication describes a code of practice for quality control in mammography. The handbook is mainly intended for radiographers, and contains technical aspects with respect to X-ray equipment, film processing and viewing conditions. Methods for evaluating image quality with technical phantoms and calculation of dose to glandular tissue are also included. Measuring devices and quality control equipment needed for the different constancy tests and status tests are described. Tolerances to the test results are given, and when the measurements confirm values outside these tolerances, certain efforts are suggested. 5 refs., 12 figs.

1925 (NIRS-M–94, pp. 3-13) **Influence of dose-rate on tumorigenesis in mice irradiated with gamma-rays from cesium 137.** Otsu, Hiroshi (National Inst. of Radiological Sciences, Chiba (Japan)); Kobayashi, Shigeru; Noda, Yuko; Furuse, Takeshi; Shiragai, Akihiro; Fukutsu, Kumiko; Kawashima, Naoyuki; Sato, Fumiaki. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

Among various types of neoplasms, thymic lymphomas developed most frequently (60-80%) in C_{57}BL/6J mice of both sexes, continuously whole-body given a total dose of 20 or 39 Gy at a low dose-rate of 37.5 cGy/day, in an age-dependent manner, but without sex-dependency. A certain level of sensitivity to the induction of thymic lymphoma was confirmed to exist from 28 through 200 days of age, and from then to decrease with increasing age. The incidence of thymic lymphoma decreased from 81 to 23 or 4% with reduction of the dose-rate from 37.5 cGy/day to 8.4 or 2.9, respectively, with a total dose of 20 Gy; it decreased from 60% to 23% with reduction of the dose rate from 37.5 cGy/day to 8.4 with a total dose of 39 Gy. Lung tumor and liver tumor showed higher incidence in mice exposed to a total dose of 20 Gy at a dose-rate of 8.4 cGy/day than in mice at the higher dose-rate of 37.5 cGy/day, and multiplicity in tumorigenesis was noticed in the lower dose-rate groups. The incidence of all the types of neoplasms, and of lung tumor and liver tumor separately, were used to calculate the dose dose-rate effectiveness factor (DDREF), which resulted in a range of 0.7 to 15. A new study is currently in progress with the purpose of obtaining more precise dose dose-rate effectiveness factors. (author).

1926 (NIRS-M–94, pp. 14-20) **Threshold-like dose response of skin carcinogenesis by repeated beta irradiation in mice.** Ootsuyama, Akira (National Cancer Center, Tokyo (Japan). Research Inst.); Tanooka, Hiroshi. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

Threshold-like response of radiation carcinogenesis was investigated using repeated irradiation of the mouse skin (female ICR, 7 weeks old) with beta rays (2.24 MeV) from a ^{90}Sr-^{90}Y. The skin was irradiated 3 times a week until emergence of tumor or death of mice throughout the life span of the mice. Ten experimental groups with different doses (0.5, 0.75, 1.0, 1.5, 2.5, 3.0, 3.5, 4.7, 8.0, 11.8 Gy per exposure) were examined. A 100% cumulative tumor incidence was obtained with 1.0 to 11.8 Gy per exposure. For doses 2.5 to 11.8 Gy groups, each group showed identical timing of tumor incidence in spite of wide differences of dose. Between 1.5 Gy and 2.5 Gy groups, but there occurred sudden delay of tumor emergence for about 200 days. Only two tumors were found in the 0.75 Gy group near the end of life span of the mice. No tumor was found in the 0.5 Gy group during the mouse life span as well as control unirradiated group. By plotting the time lengths required for 50% tumor incidence against beta dose given per exposure, the saturation effect was shown for doses between 2.5 to 11.8 Gy and a sharp increase of the 50% tumor time was shown for lower doses below 2.5 Gy per exposure. These seemed to exist a threshold-like dose response for tumor induction by repeated beta irradiation. (author).

1927 (NIRS-M–94, pp. 21-30) **Age-dependence of susceptibility.** Sasaki, Shunsaku (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

The present study was aimed to clarify age-dependence of susceptibility to induction of late effects of whole-body irradiation of γ-rays. Experimental data using female B6C3F_1 mice were made subject of analysis. In this experiment mice were irradiated at day 14 or 17 prenatal age or day 0, 7, 35, 105, 240 or 365 postnatal age with doses ranging from 0.95 to 5.7 Gy and were allowed to live out their entire life spans under a specific pathogen free condition. The cumulative relative risk for mortality and fraction of excess mortality were estimated from increase in the age-specific mortalities. Among mice irradiated at day 0 with 0.95 Gy the fraction of excess mortality and cumulative relative risk were 0.38 and 1.61, respectively; whereas, shortening of the mean life span was 6.6%. Shape of dose-response relationship for the fraction of excess mortality was downward concave and that for the cumulative relative risk was upward concave. The cumulative relative risks in mice irradiated during neonatal or juvenile period were apparently higher than those irradiated during adulthood or prenatal period. Cumulative relative risks decreased more rapidly with increasing age when mice were irradiated during juvenile or young adult period than those after irradiation during neonatal or fetal period. Age-associated variation of the cumulative relative risk was little in mice irradiated during the middle-age adult period. Using the cumulative relative risk for tumor development as a measure of tumorigenic effect of radiation, dose-response relationships for induction of liver, pituitary, ovarian, lung and Harderian gland tumors after irradiation at various ages were compared each other. Results of analysis suggested that mice of neonatal and juvenile period are susceptible to tumorigenic effect and cell-killing effect of radiation. (author).

1928 (NIRS-M–94, pp. 31-36) **Radiation and offspring cancer.** Nomura, Taisei (Osaka Univ. (Japan). Faculty of Medicine). National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

Parental exposure to radiation could induce various kinds of tumors in the next generation. In ICR mice, a large and significant increase of adult types tumors was observed in the F_1 offspring after X-ray exposure at spermatozoa and spermatid stages, and less clear increase was observed after spermatogonial exposure. Mature oocytes were resistant up to 1 Gy, but very sensitive to tumor induction at higher doses. While there was no difference in the tumor incidence between acute and fractionated (0.36 Gy at 2 hr intervals) irradiation at postgonial stages, any kinds of tumors were not increased by the fractionated exposure of spermatogonia and mature oocytes, suggesting that only postmeiotic sperm are susceptible to protracted exposure to radiation at low dose rate. These radiation-induced germ-line mutations causing tumors showed dominant inheritance of tumor susceptibility. Acute lymphocytic leukemia was not induced in the F_1 offspring of ICR and LT mice after spermatogonial exposure in contrast to a large increase of adult type cancers. However, 1.9-3.2 fold and 4.5-7.4 fold increases of leukemia incidence were observed in ICR and LT mice, when spermatozoa stage was treated with the X-ray doses of 0.36-5.04 Gy and 3.6-5.04 Gy, respectively, indicating the large difference in the sensitivity of developing germ cells to leukemia induction. In contrast to ICR and LT mice, N5 strain developed about 10 or 18 times higher incidence of leukemia in the offspring after spermatogonial or spermatozoa exposure to 5.04 Gy of X-rays, respectively, showing a marked difference in the sensitivity to the leukemia induction by radiation among mouse strains. These differential sensitivities between germ cell stages and also between mouse strains reconcile in part the difference between two population studies in Hiroshima/Nagasaki and Sellafield. (author).

1929 (NIRS-M–94, pp. 39-48) **Effect of radiation on transgenic mice carrying a variety of oncogenes.** Inoue, Tohru

(Yokohama City Univ. (Japan). Faculty of Medicine); Hirabayashi, Yoko. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

We have been trying to see a rule of regulation in proliferation and differentiation of the hemopoietic stem cells, specifically at an in vivo-level of mice that had been transferred a variety of oncogenes into the stem cells. Among the various methods available for transgenes, transgenic mice used in the present purposes are, at this moment, the most efficient way to observe function of gene of interests in hemopoietic stem cells, to which genes are introduced rarely because of two reasons, i.e., their extremely lower frequency in the bone marrow, and their prominent quiescence in cellular kinetics. To use such transgenic mice, we also applied transplantation assay, in which mice, repopulated with bone marrow cells carrying the gene of interests, consisted the gene solely in the hemopoietic system. This system permitted to avoid a possible competitive risk between the leukemogenesis and the carcinogenesis in other organs. In the present article, we introduced first the transplantation assay in which the recipient mice were repopulated with bone marrow cells carrying human c-myc gene; second kinetics of the hemopoietic stem cells in the myc-mice; furthermore, radiation effects on leukemogenesis of the h-c-myc marrow followed by discussion of the results. We also introduced our experimental model for the myelodysplastic syndrome, i.e., a multilineage abnormal growth of hemopoietic elements, appeared in the SV40-large T transgenic mice, for the future research studying a mechanism of radiation leukemogenesis. (author).

1930 (NIRS-M–94, pp. 49-58) **TL transgenic mouse strains.** Obata, Y. (Aichi Cancer Center, Nagoya (Japan). Research Inst.); Matsudaira, Y.; Hasegawa, H.; Tamaki, H.; Takahashi, T.; Morita, A.; Kasai, K. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

As a result of abnormal development of the thymus of these mice, TCR $\alpha\beta$ lineage of the T cell differentiation is disturbed and cells belonging to the TCR $\gamma\delta$ $CD4^-$ $CD8^-$ double negative (DN) lineage become preponderant. The $\gamma\delta$ DN cells migrate into peripheral lymphoid organs and constitute nearly 50% of peripheral T cells. Immune function of the transgenic mice is severely impaired, indicating that the $\gamma\delta$ cells are incapable of participating in these reactions. Molecular and serological analyses of T-cell lymphomas reveal that they belong to the $\gamma\delta$ lineage. $Tg.Tla^a$-3-1 mice should be useful in defining the role of TL in normal and abnormal T cell differentiation as well as in the development of T-cell lymphomas, and further they should facilitate studies on the differentiation and function of $\gamma\delta$ T cells. We isolated $T3^b$-TL gene from B6 mice and constructed a chimeric gene in which $T3^b$-TL is driven by the promoter of $H\text{-}2K^b$. With the chimeric gene, two transgenic mouse strains, Tg. Con.3-1 and -2 have been derived in C3H background. Both strains express TL antigen in various tissues including skin. The skin graft of transgenic mice on C3H and $(B6 \times C3H)F_1$ mice were rejected. In the mice which rejected the grafts, $CD8^+TCR\alpha\beta$ cytotoxic T cells (CTL) against TL antigens were recognized. The recognition of TL by CTL did not require the antigen presentation by H-2 molecules. The results indicated that TL antigen in the skin becomes a transplantation antigen and behaves like a typical allogeneic MHC class I antigen. The facts that $(B6 \times C3H)F_1$ mice rejected the skin expressing $T3^b$-TL antigen and induced CTL that killed TL^+ lymphomas of B6 origin revealed that TL antigen encoded by $T3^b$-TL is recognized as non-self in B6 mice. (J.P.N.).

1931 (NIRS-M–94, pp. 61-65) **Gene rearrangement and radiation carcinogenesis: BCR/ABL and RET oncogene.** Ito, Takashi (Radiation Effects Research Foundation, Hiroshima (Japan)); Seyama, Toshio; Nakamura, Nori; Akiyama, Mitoshi; Dohi, Kiyohiko. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

The development of leukemia and thyroid cancer is characterized by activation of the abl oncogene and ret oncogene, respectively. In order to clarify the relationship between these gene aberrations and radiation, the pro-myelogenous leukemia-derived cell line HL60 and the thyroid cancer-derived cell line 8505C, were irradiated in vitro with 100Gy of X-rays. RNA was then extracted from 10^8 cells of the respective cell lines and examined by the reverse transcription PCR method for rearrangements of abl and ret genes. Five kinds of positive bands were observed in the HL-60 cells irradiated with 100Gy of X-ray. Similarly, six positive bands were also observed in the 8505C cells irradiated with 100Gy. In vitro X-irradiation activation of oncogenes found in radiation induced cancers imply that gene rearrangement by X-rays is involved in the development of malignant tumors. Furthermore, in an experiment to detect radiation effects in A-bomb survivors, RNA was extracted from about 10^7 peripheral blood neutrophils obtained from 12 heavily exposed individuals and six controls, and the presence of cells having the BCR-ABL fusion gene was studied using the reverse transcription PCR method. Although the reverse transcription PCR method has the sensitivity to detect one Ph^1 positive K562 cell in $1x10^6$ neutrophils, the Ph^1 gene could not be detected in the A-bomb survivors mentioned above. RNA was also extracted from the cancer tissues of 24 A-bomb exposed thyroid cancer cases and 21 nonexposed thyroid cancer cases, and rearrangement of ret oncogenes was studied by the reverse transcription PCR method. Activated ret oncogenes were observed in three of the 24 A-bomb exposed thyroid cancer cases, but none were observed in the 21 nonexposed cases. With regard to gene rearrangements A-bomb late effects could not be detected in the peripheral blood of A-bomb survivors. (J.P.N.).

1932 (NIRS-M–94, pp. 66-72) **P53 in differentiation of thyroid cancer.** Seyama, Toshio (Radiation Effects Research Foundation, Hiroshima (Japan)); Ito, Takashi; Akiyama, Mitoshi; Hayashi, Yuzo; Dohi, Kiyohiko. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

p53 is a tumor suppressor gene with such a recessive nature and is inactivated in many carcinomas. DNA was extracted from 10 primary papillary adenocarcinomas and eight undifferentiated carcinomas of the thyroid, using three 5 μm sliced paraffin segments, and then amplified by PCR. The products were analyzed for mutations in the p53 gene exons 5 to 8 by the direct sequencing method and for allelic deletion by the RFLP method. In five human thyroid carcinomas, DNA was extracted from each tissue and analyzed. Mutations in the p53 gene exons 5 to 8 and p53 gene deletions were not detected in the 10 papillary adenocarcinomas, mutations were detected in seven of eight cases and allelic deletions was detected in three of the five cases examined. In each of the five cases which had both differentiated and undifferentiated tissues in the same tumor, p53 gene mutations were not detected in the differentiated tissues while mutations and gene deletions were detected in the undifferentiated sections. The p53 gene was analyzed using paraffin-embedded tissues by the combined use of the direct sequencing and PCR methods and by the RFLP method. It was found that the progression of human thyroid carcinoma is closely related to the p53 genetic changes. Furthermore, the analysis of differentiated and undifferentiated tissues in the same tumor showed that human undifferentiated thyroid carcinomas develop from differentiated carcinomas. (J.P.N.).

1933 (NIRS-M–94, pp. 73-79) **The SCID-hu mouse and its application to human radiation biology: Analysis of sensitivity to X-irradiation using a bone marrow model.** Kyoizumi, Seishi (Radiation Effects Research Foundation, Hiroshima (Japan)); Akiyama, Mitoshi; McCune, J.M.; Namikawa, Reiko. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to*

mechanism elucidation. 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

The radiobiological study of humans has been hampered by a lack of suitable in vivo experimental models. Of course, acute and chronic radiation effects in humans have been documented in the studies of atomic bomb (A-bomb) survivors and patients irradiated either by therapeutic intent or by accident. However, the information gained from these studies has been limited by the difficulties in estimating precise radiation doses and in obtaining biological samples for directly analyzing the processes of radiation-induced pathogenesis. With these issues in mind, we propose that the severe combined immunodeficient mouse-human chimera can be used as an in vivo experimental model for human radiation biology. We have developed techniques by which normal human bone marrow can be implanted into immunodeficient C.B-17 scid/scid (SCID) mice (S. Kyoizumi et al, Blood 79, 1704, 1992). We have report that this in vivo model can be used for the analysis of radiation damage to human bone marrow. After whole-body irradiation of the engrafted animals, human progenitor cells within the human marrow were destroyed in a dose-dependent manner (D_0 = 0.7-1.0Gy, n = 1.0). Acute hematotoxicity was reduced when the radioprotective agent (WR-2721) was administered prior to irradiation. After low dose irradiation, the recovery of human progenitor activity was accelerated by treatment with human granulocyte-colony stimulating factor (G-CSF). This small animal model may prove amenable for the risk analysis of human radiation exposure as well as for the development of new modalities for the prevention and treatment of radiotoxic damage to the human hematopoietic system. (author).

1934 (NIRS-M–94, pp. 83-89) **Roles of gap junctions and tight junctions in the development of liver cancer and metastatic tumors.** Mori, Michio (Sapporo Medical Coll. (Japan)); Enomoto, Katsuhiko. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

Roles of the gap junctions and tight junctions in the development of liver cancer and the formation of metastatic tumors were studied. The gap junction mediates communications between cells by allowing inorganic ions and other water-soluble small molecules to pass directly from the cytoplasm of one cell to the cytoplasm of another, thereby playing an essential role in maintaining tissue homeostasis. Expression of gap junction proteins decreased progressively in association with the advance of the stages of hepatocarcinogenesis in rats. On the other hand, treatment of HuH-6 human hepatoblastoma cells with either retinoic acid or dibutyryl cAMP, or co-culture with BALB/c 3T3 cells suppressed the expression of AFP. Such treatment induced the expression of mRNA for gap junction proteins. The tight junction functions as a barrier to ions and small molecules, which pass through the intercellular spaces thus the integrity of endothelial tight junctions could prevent the extravasation of metastatic tumor cells. Recently, we developed a new monoclonal antibody for a tight junction-associated protein. The new protein, 7H6, was expressed in accordance with the development of the integrity of endothelial tight junctions, and the migration of SST-2 rat mammary cancer cells through the RLE (rat lung endothelial) cell monolayer was markedly inhibited when 7H6 was expressed at the tight junction areas of RLE cells. (author).

1935 (NIRS-M–94, pp. 90-95) **Extracellular matrix in carcinogenesis.** Sakakura, Teruyo (Institute of Physical and Chemical Research, Tsukuba, Ibaraki (Japan). Tsukuba Life Science Center). National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

(1) Epithelial-stromal interactions are important for organogenesis during embryonic development. In adult stage, the continuous interactions still persist. If particular change, such as embryonic change, occurs in the stroma, the epithelium responds the altered stroma and proliferates in the localized area. Mammary tumor development is stimulated by interaction with embryonic stroma, and intestinal metaplasia is induced by transplantation of embryonic intestinal stroma beneath the stomach mucosa. (2) One of the molecular mechanisms that mediate the interactions between these two tissues is anexchange of the informations through extracellular matrix substances. Tenascin, and extracellular matrix glycoprotein, is characterized by its onco-fetal type of distribution in the tissue. In mammary gland development, tenascin appears in the dense stroma surrounding the budding epithelium at embryonic stage and juvenile, and reappears during cancer development. The function of tenascin is not clear yet, but is supposed to function as a homeostatic factor in the repair of tissue perturbation. (author).

1936 (NIRS-M–94, pp. 96-105) **Cell interaction in the thymic microenvironment.** Hirokawa, K. (Tokyo Metropolitan Inst. of Gerontology (Japan)); Kasai, M.; Utsuyama, M.; Kurashima, C.; Konno, A. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

The cell interaction in the thymic microenvironment is mediated either by soluble factors such as various cytokines or by direct cell to cell reaction, cognate reaction. The cognate reaction between T cell receptors of developing T cells and MHC molecule of thymic epithelial-stromal cells is the essential process for positive and negative selection of T cell repertoires, although its molecular mechanism is still not clearly understood. Various cytokines are known to be produced in the thymic microenvironment, either by epithelial cells or by non-epithelial stromal cells. Two new types of cytokines produced by thymic epithelial cells are reported in this presentation. One is proenzyme form of cathepsin L, which can promote proliferation of immature thymocytes in the presence of IL-1 and IL-7. Cathepsin L is a kind of lysozyme enzyme widely observed in many tissues, but the secretion of its proenzyme form is exclusively observed in embryonic and young thymus, but not in old thymus. The other factor can promote cell death of double positive ($CD4^+8^+$) thymocytes in vitro. The cell death caused by the factor is consistent with so-called 'apoptosis', as typical DNA laddering is observed by PAGE analysis. This apoptosis inducing factor is produced by a thymic epithelial cell line (S103), established from adult thymus, but not from newborn thymus. These two types of factors showing opposite function appear to play an important role in the cell interaction in the thymic microenvironment; e.g., T cell development as well as age change of the thymus. (author).

1937 (NIRS-M–94, pp. 109-117) **Analysis of the clonality of prelymphoma cells and approach to the study of initial events on radiation-induced lymphomagenesis.** Muto, Masahiro (National Inst. of Radiological Sciences, Chiba (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

With a combined use of cell separation by cell sorter and intrathymic injection assay, we found that the main target cells for radiation-induced thymic lymphomagenesis are DN($CD4^-CD8^-$), CD8SP($CD4^-CD8^+$), and DP($CD4^+CD8^+$) cycling immature, $J11d^+$ thymocytes. After leukemogenic irradiation, the thymocytes expressing TL-2 antigen which is not expressed on normal thymocytes of the B10 mice occur from these immature cycling thymocytes, and the prelymphoma cells develop infrequently from these $TL\text{-}2^+$ cells. To analyze the clonality of prelymphoma cells and to construct the experimental system for investigating the initial events of radiation-induced lymphomagenesis, limited numbers of $TL\text{-}2^+$ thymocytes from individual irradiated mice (A-H) were injected into thy 1 congenic mice intrathymically, and DNA from the donor type T cell lymphomas was analyzed by Southern blot analysis and examined the DNA sequences of V-J junctional sites. Since the rearranged TCR (T cell receptor) gene is a very useful indicator of clonal origin and the TCR rearrangement is a sequential process and unique to the progeny of each clone, one of the strategies for investigating the oncogenic processes is to analyze both the alteration of the genes or chromosomes from lymphomas derived from

a single donor by intrathymic injection of limited number of prelymphoma cells and the patterns of TCR rearrangements of these lymphomas. The results of the rearrangement patterns of γ and βT cell receptor genes and the nucleotide sequences of the V_{γ}-J_{γ} junctions suggest that after leukemogenic irradiation, multiple preneoplasia might occur from some of the TL-2+ cells and only a proportion of induced pre-neoplastic cells (prelymphoma cells) may convert to malignancy. Novel rearrangements of $V_{\gamma}4$ with non-γ elements were observed in these lymphoma cells. (J.P.N.).

1938 (NIRS-M–94, pp. 145-150) **Cancer incidence in the atomic bomb survivors.** Mabuchi, Kiyohiko (Radiation Effects Research Foundation, Hiroshima (Japan)). National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

This report presents comprehensive solid-cancer incidence data and risk estimates for A-bomb survivors in the extended Life Span Study cohort. Cancer cases occurring among members of the LSS cohort were identified as part of the Hiroshima and Nagasaki tumor registries standard registration process. Among 79,972 individuals, 8,613 first primary solid cancers were diagnosed between 1958 and 1987. A standard set of analyses was carried out for each of the organs and organ systems, using DS86 organ or kerma doses. Consistent with prior LSS findings on mortality, a statistically significant excess risk for all solid cancers was demonstrated. Significant radiation associations were observed for cancers of the stomach, colon, lung, breast, ovary, urinary bladder and thyroid. For the first time, radiation has been associated with liver and non-melanoma skin cancer incidence in the LSS cohort. The present analysis also strengthened earlier findings, based on a smaller number of cases, of an effect of A-bomb radiation on salivary gland cancer. Analyses of solid tumors individually and in combination revealed no appreciable differences between Hiroshima and Nagasaki. The combined solid-tumor analysis demonstrated a two-fold greater relative risk for females than males and a trend for a decreasing relative risk with increasing age at exposure. Previous LSS studies focused primarily on the association between cancer mortality and radiation exposure. Although these mortality studies are extremely valuable, the accuracy of cancer diagnoses is limited, and death certificates do not provide adequate information on cancers with relatively high survival rates. Although incidence data also have their limitations, they can provide more complete data on cancers with lower mortality, on histologic type, and on time from exposure to cancer onset. Future analyses of atomic-bomb survivors should focus on both cancer mortality and incidence. (author).

1939 (NIRS-M–94, pp. 157-163) **Suppression of radiation-induced in vitro carcinogenesis by ascorbic acid.** Tauchi, Hiroshi (Hiroshima Univ. (Japan). Research Inst. for Nuclear Medicine and Biology); Sawada, Shozo. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

The effects of ascorbic acid on radiation-induced in vitro carcinogenesis have been reported using neoplastic transformation system of C3H 10T1/2 cells. In these reports, no suppressive effect on X-ray-induced transformation was observed with 6 weeks' administration of ascorbic acid (daily addition for 5 days per week) by Kennedy (1984), whereas apparent suppression was observed with daily addition for 7 days by Yasukawa et al (1989). We have tested the effects of ascorbic acid on ^{60}Co gamma-ray or ^{252}Cf fission neutron-induced transformation in Balb/c 3T3 cells. The transformation induced by both types of radiations was markedly suppressed when ascorbic acid was daily added to the medium during first 8 days of the post-irradiation period. If ascorbic acid was added for a total of 8 days but with a day's interruption in the middle, the suppression of transformation was decreased. These results suggest that continuous presence of ascorbic acid for a certain number of days is needed to suppress radiation-induced transformation. Since ascorbic acid also suppressed the promotion of radiation-induced transformation by TPA when both chemicals were added together into the medium, ascorbic acid might act on the promotion stage of transformation. Therefore, the effect of ascorbic acid on the distribution of protein kinase C activity was also investigated, and possible mechanisms of suppression of radiation-induced transformation by ascorbic acid will be discussed. (author).

1940 (NIRS-M–94, pp. 186-191) **The effect of calorie restriction of radiation-induced myeloid leukemogenesis.** Yoshida, Kazuko (National Inst. of Radiological Sciences, Chiba (Japan)); Nemoto, Kumie; Sado, Toshihiko; Inoue, Tohru. National Inst. of Radiological Sciences, Chiba (Japan). Nov 1993. (In Japanese). (CONF-9212124–: 24. NIRS symposium, Chiba (Japan), 3-4 Dec 1992). In *Radiation carcinogenesis and its control: Approaches to mechanism elucidation.* 206p. Order Number DE94792669. Source: OSTI; NTIS; INIS.

The spontaneous incidence of myeloid leukemia was about 1% in C3H/He male mice, however it could be increased 23.3% after 3 Gy whole body radiation. Then, we examined whether or not the incidence of myeloid leukemia was decreased by calorie restriction. The diets were arranged so that the mice were from each experimental groups ingested similar amount of protein, lipid, vitamins and minerals. The mice of restricted A groups (RA) were fed of the same calorie (95Kcal) of control groups until radiation (10 weeks old). Then, they were controlled to keep a body weight of 25-27g using 60 to 95 Kcal diet. The other groups (RB) were restricted from 6 weeks old. The incidence of myeloid leukemia in radiation plus control diet groups was 21%, however, in calorie restricted groups it is significantly decreased compared with control diet group. The incidence in 3RA and 3RB group is 10.2 and 6.7% respectively. Besides, the latent period of myeloid leukemia also is prolonged in the both calorie restricted groups compared to control diet group. (author).

1941 (PNL–9000-Pt.4) **Pacific Northwest Laboratory annual report for 1993 to the DOE Office of Energy Research: Part 4: Physical sciences.** Braby, L.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001483. Source: OSTI; NTIS; INIS; GPO Dep.

Part 4 of the Pacific Northwest Laboratory Annual Report for 1993 to the DOE Office of Energy Research includes those programs funded under the title "Physical and Technological Research." The Field Task Program Studies reported in this document are grouped by budget category. Attention is focused on the following subject areas: dosimetry research; and radiological and chemical physics.

1942 (PTB-Dos–23) **New dose units in radiation protection.** Alberts, W.G.; Ambrosi, P.; Boehm, J.; Dietze, G.; Hohlfeld, K.; Will, W. Physikalisch-Technische Bundesanstalt, Braunschweig (Germany). Dosimetrie. Jul 1994. 64p. (In German). Order Number DE95715283. Source: OSTI; NTIS (US Sales Only); INIS.

The 'Normenausschuss Radiologie' (German Standards Committee on Radiology, NAR) and the Physikalisch-Technische Bundesanstalt (PTB) have recommended the introduction of new quantities in the field of radiation protection measurements for external exposure in Germany as of January 1995. The present report serves as a support for this recommendation. It describes the present, radiation type related system of quantities and the new quantities as proposed by the ICRU which are the same for all types of radiation. The implications of the introduction of the new quantities in individual and area monitoring are described. In particular, changes of calibration procedures are considered, and numerical values needed for these procedures are given. Two chapters deal with special problems connected with instrument testing and verification and with provisional arrangements. (orig./HP)

1943 (RERF-R–1-93) **G-banding analysis of radiation-induced chromosome damage in lymphocytes of Hiroshima atomic-bomb survivors.** Ohtaki, Kazuo; Nakashima, Eiji. Radiation Effects Research Foundation, Hiroshima (Japan). Jun 1994. 22p. Order Number DE95709883. Source: OSTI; NTIS; INIS.

This report describes the G-banding analysis of somatic chromosomes in lymphocytes from 63 atomic-bomb survivors in Hiroshima

to determine the type and frequency of radiation-induced chromosome aberrations. Summary findings are as follows: (1) The cells with stable-type chromosome aberrations (Cs cells) predominated among the aberrant cells and showed a dose-dependent increase. All stable chromosome aberrations were classified into 9 types: reciprocal translocations (t), translocations of complex type (t-cx), insertions (ins), complex exchanges (e-cx), peri- and paracentric inversions (inv-peri, inv-para), terminal and interstitial deletions (del-ter, del-int), and unidentified rearrangements. Aberration frequencies increased with increasing dose for all aberration categories. Among the chromosome aberrations classified, reciprocal translocations predominated in all dose ranges. The frequencies of complex aberrations were low at the low-dose level but increased sharply as dose increased. (2) The linear model was fitted to test the dose-response relationship for Cs-cell frequencies. With a constant neutron relative biological effectiveness of 10, an estimated linear slope of 15.2%/Sv was obtained for Dosimetry System 1986 bone-marrow dose with an intercept of 2.9% at dose 0. The present observation confirmed a wide variability of Cs-cell frequencies among individual survivors in every dose category.(3) Statistical analysis of data on 3370 break sites showed good correlations between relative DNA content and the distribution of chromosome breaks involved in translocations, although the involvement of chromosome 1 is significantly higher, for as-yet-unknown reasons. (J.P.N.).

1944 (SSI–94-03) **Measurement of radiation dose with a PC-based instrument.** Jangland, L. (Akademiska Sjukhuset, Uppsala (Sweden). Dept. of Hospital Physics); Neubeck, R. Swedish Radiation Protection Inst., Stockholm (Sweden). 20 May 1994. 30p. (In Swedish). Order Number DE95606197. Source: OSTI; NTIS; INIS.

The purpose of this study was to investigate in what way the introduction of Digital Subtraction Angiography has influenced absorbed doses to the patient and personnel. Calculation of the energy imparted to the patient, ϵ, was based on measurements of the dose-area product, tube potential and tube current which were registered with a PC-based instrument. The absorbed doses to the personnel were measured with TLD. The measurements on the personnel were made only at the digital system. The results indicate large variations in ϵ between different types of angiographic examinations of the same type. The total ϵ were similar on both systems, although the relative contribution from image acquisition and fluoroscopy were different. At the conventional system fluoroscopy and image acquisition contributed almost equally to the total ϵ. At the digital system 25% of the total ϵ was due to fluoroscopy and 75% to image acquisition. The differences were due to longer fluoroscopic times on the conventional system, mainly due to lack of image memory and road mapping, and lower ϵ/ image, due to lower dose settings to the film changer compared to the image intensifier on the digital system. 11 refs., 8 figs., 9 tabs.

1945 (SSI–94-04) **Personnel monitoring. 1993.** Bergman, L. Swedish Radiation Protection Inst., Stockholm (Sweden). 10 Jun 1994. 5p. (In Swedish). Order Number DE95606198. Source: OSTI; NTIS; INIS.

Tables with text in English.

During the year we measured whole body doses on 11260 bearers, distributed as follows: 0-0,5 mSv on 9664 persons; 0,6-1,0 mSv on 757 persons; 1,1-5,0 mSv on 785 persons; >5 mSv on 54 persons. At higher dose than 4 mSv/4 weeks, the reason to the irradiation will be investigated. 2 figs., 2 tabs.

1946 (SSI–94-05) **Nuclear power industry - activity discharges - occupational exposures. 1993.** Swedish Radiation Protection Inst., Stockholm (Sweden). 16 Jun 1994. 40p. (In Swedish). Order Number DE95606199. Source: OSTI; NTIS; INIS.

Compilation of activity discharges and personnel doses in Swedish nuclear power plants 1993.

1947 (Y/DQ–51) **Technical basis for beta skin dose calculations at the Y-12 Plant.** Thomas, J.M.; Bogard, R.S. Oak Ridge National Lab., TN (United States). Mar 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001695. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the methods for determining shallow dose equivalent to workers at the Oak Ridge Y-12 Plant from skin contamination detected by survey instrumentation. Included is a discussion of how the computer code VARSKIN is used to calculate beta skin dose and how the code input parameters affect skin dose calculation results. A summary of Y-12 Plant specific assumptions used in performing VARSKIN calculations is presented. Derivations of contamination levels that trigger the need for skin dose assessment are given for both enriched and depleted uranium with the use of Y-12 Plant site-specific survey instruments. Department of Energy recording requirements for nonuniform exposure of the skin are illustrated with sample calculations.

5602 Thermal Effects

Refer also to citation(s) 447, 448

5603 Chemicals Metabolism and Toxicology

Refer also to citation(s) 457, 494, 512, 613, 1758, 1759, 1794, 1807, 1808, 1809, 1810, 1811, 1812, 1813, 1814, 1815, 1816, 1817, 1818, 1819, 1820

1948 (CONF-9407126–1) **Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures.** Hingerty, B.E. (Oak Ridge National Lab., TN (United States)); Crawford, O.H.; Broyde, S.; Wagner, R.A. Oak Ridge National Lab., TN (United States); New York Univ., NY (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States);National Insts. of Health, Bethesda, MD (United States). DOE Contract AC05-84OR21400 ; FG02-90ER60931. Grant CA28038; Grant RR06458. From 2. DOE-Energy Research Power users symposium; Rockville, MD (United States); 12 Jul 1994. Order Number DE94018118. Source: OSTI; NTIS; GPO Dep.

The nucleic acids molecular mechanics program DUPLEX has been designed with useful features for surveying the potential energy surface of polynucleotides, especially ones that are modified by polycyclic aromatic carcinogens. The program features helpful strategies for addressing the multiple minimum problem: (1) the reduced variable domain of torsion angle space; (2) search strategies that emphasize large scale searches for smaller subunits, followed by building to larger units by a variety of strategies; (3) the use of penalty functions to aid the minimizer in locating selected structural types in first stage minimizations; penalty functions are released in terminal minimizations to yield final unrestrained minimum energy conformations. Predictive capability is illustrated by DNA modified by activated benzo[a]pyrenes. The first stage of adaptation to parallel computers is described.

1949 (DOE/ER/61077–8) **Characterizing and imaging carcinogenic materials using ion beams and lasers: Progress report.** Pennsylvania State Univ., University Park, PA (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER61077. Order Number DE95002948. Source: OSTI; NTIS; GPO Dep.

This report focuses on the performance of a Kratos TOF-SIMS reflectron-based mass spectrometer equipped with a liquid metal ion gun. The analyzer exhibits a nominal mass resolution of better than 1 part in 10,000 with a transmission of about 50%. The secondary ion extraction optics has been optimized for laser postionization where there is a large ionization volume, and for SIMS where the ions originate from a point source on the surface. Experiments with benzopyrene have suggested that it is possible to improve upon the ionization efficiency of molecular species by moving into the subpicosecond regime.

1950 (INIS-mf–15063) **International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.** Ulrich, B. (ed.). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. (In German, English). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen

(Germany), 2-6 Oct 1989). Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

In the two lecture volumes of the Proceedings of the International Congress on Forest Decline Research the papers are presented according to the topics of the plenary and poster sessions. The sessions had been devoted to the damage symptoms in forest decline, to the main stressors (atmosphere, climate, soil, biota), to the effects of the stressors (on rhizosphere, on decomposers, and on plants) (see vol. 1), to case studies (in Germany and abroad), to regional comparisons, to critical loads, and to silvicultural measures (see vol. 2). Additionally personal impressions about the forest decline phenomen in Germany and its causes and opinions about the perspective in regard to research needs, to silvicultural practices and to emission control are given. (orig./vhe)

1951 (INIS-mf–15063, pp. 699-706) **ALBIOS: an analysis of aluminium biogeochemistry in forested watersheds of North America and Northern Europe.** Cronan, C.S. (Dept. of Botany and Plant Pathology, Maine Univ., Orono, ME (United States)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 431p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings.* Order Number DE95716290. Source: OSTI; NTIS (US Sales Only); INIS.

The comparative field results demonstrated important interregional differences in the concentrations of labile Al and strong acid anions in soil drainage and surface waters at the study catchments. Results also showed that for those watersheds containing soils with < 10% base saturation, increased concentrations of SO_4^{2-} plus NO_3^- in soil drainage waters were accompanied by increased concentrations of labile Al. Nutritional effects from Al exposure generally occured at lower labile Al concentrations than those associated with growth reductions. (orig.)

1952 (INIS-mf–15065) **International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.** Ulrich, B. (ed.). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. (In German, English). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

In the two lecture volumes of the Proceedings of the International Congress on Forest Decline Research the papers are presented according to the topics of the plenary and poster sessions. The sessions had been devoted to the damage symptoms in forest decline, to the main stressors (atmosphere, climate, soil, biota), to the effects of the stressors (on rhizosphere, on decomposers, and on plants) (see vol. 1), to case studies (in Germany and abroad), to regional comparisons, to critical loads, and to silvicultural measures (see vol. 2). Additionally personal impressions about the forest decline phenomen in Germany and its causes and opinions about the perspective in regard to research needs, to silvicultural practices and to emission control are given. (orig./vhe)

1953 (INIS-mf–15065, pp. 21-41) **Forest decline in ecosystem perspective.** Ulrich, B. (Inst. fuer Bodenkunde und Waldernaehrung, Goettingen Univ. (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

This paper, presented at the opening session of the congress, gives an introduction into the subject, summarizes the current state of forest decline research, and points out areas requiring further research. The following individual aspects are briefly dealt with: ecosystem perspective, criteria of forest decline, changes in chemical climate, adjustment of organism to changes in their environment, hypotheses on forest decline, predisposing effects, changes in the chemical soil state, natural and man-made soil acidification and vegetation type, changes in nutrient regimes and in forest growth, time course of soil acidification, the effect of soil acidification on trees, the water stress hypotheses of crown thinning of spruce, uncertainties in forest planning and management, deficiencies in the control of forest ecosystems, results of material balance case studies, restoration of the chemical soil state, environmental monitoring, hypothesis in respect top effects of air pollutants, missing basic knowledge, principles of self-organisation of ecosystems, the need for ecosystem research. (vhe)

1954 (INIS-mf–15065, pp. 43-59) **Trends in, and current state of, forest damage surveying.** Kennel, E. (Lehrstuhl fuer Waldbau und Forsteinrichtung, Muenchen Univ. (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Early in the 80s, when it became obvious that damage detected in various needle and leaf trees did not reflect regional problems of individual tree species but, rather, damage in, and a threat to, forests on a large scale, permanent observation plots were established. Of unsystematic distribution, they are located in the major damage areas only. Since 1982, forest damage surveys by sampling method have been conducted in addition; their results have been comparable for all federal laender since 1984. The year 1985 saw the introduction of internationally accepted rules for forest damage surveying. Damage quantificatipon and assignment to one in five categories is done according to symptoms visible to the eye (tree crown overthinning, and chlorosis of the assimilation organs). Staft in charge of surveying undergo thorough training by appropriate measuries agreed between the federal laender. The 1984-1988 forest damage surveys revealed the following: trends at the regional level are in part opposed to each other. On the whole, there is a decrease in severe damage in needle-trees and an increase in such damage in leaf-trees. The damage afflicted on the south is about twice that of the north. Regionally, the extent of damage varies widely. Hot-spots of damage are the higher parts of medium-range mountains and of the Alps. Severe injury in oak-trees shows an alarming increase in all European countries. (vhe)

1955 (INIS-mf–15065, pp. 61-79) **Forest damage and incremental growth.** Sterba, H. (Univ. fuer Bodenkultur, Vienna (Austria). Inst. fuer Forstliche Ertragslehre). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Loss of needles and crown overthinning entail changes in incremental growth or are already an expression of such changes. So far, these relationships have been the least pronounced in beech-trees, and they vary as a function of age, place of growth, other site-related factors, and the influence of nuisances. As tree growth increment in general reacts in a way not differentiated by the type of damage sustained, the causes, that is, the nuisances, must be

surveyed as well in order to permit quantification of the effect. (orig./vhe)

1956 (INIS-mf–15065, pp. 81-107) **Morphological changes in the crowns of European beech (Fagus sylvatica L.) and other deciduous tree species.** Roloff, A. (Inst. of Silviculture 2, Goettingen (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

At first general methodical problems of vitality assessment of deciduous trees are discussed. Then new methods are presented. Ecological morphology is such a new approach to explain modifications of tree growth and crown development and to detect its causes. There are four phases to discriminate: exploration, degeneration, stagnation and resignation phase which are significantly due to decreasing shoot lengths with the result of fundamental modifications of the branching structure. Especially in the leaf-less state, these different branching structures in the very treetop are to perceive from a distance and are the basic of a vitality assessment by four vitality classes. By this approach a long-term, chronic decrease of vitality can be recognized. Thereby, it is a practicable method to detect forest decline and to discriminate it from short-term influences. (orig./vhe)

1957 (INIS-mf–15065, pp. 381-404) **Effect of soil acidification on root growth, nutrient and water uptake.** Marschner, H. (Hohenheim Univ., Stuttgart (Germany). Inst. fuer Pflanzenernaehrung). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Soil acidification poses various types of stress to plants, especially Al and H^+ toxicity in roots and Mg and Ca deficiency in roots and shoots. The importance of the various types of stress varies with plant species, location and time. Average data of the chemical composition of the bulk soil or of the molar Ca/Al or Mg/Al ratios in the soil solution without consideration of the Al species are of limited value for precise conclusions of the actual, or for predictions of the potential risk of soil-acidity-induced inhibition of root growth and of nutritional imbalances. The root-induced changes in the rhizosphere and the consequences for Al toxicity and nutrient acquisition by plants deserve more attention. Further it should be considered that roots are not only required for anchoring higher plants in the soil and for nutrient and water uptake. Roots are also important sites for synthesis of phytohormones, cytokinins and abscisic acid in particular, which are transported into the shoots and act either as signals for the water status at the soil-root interface (ABA) or as compounds required for growth and development. Inhibition in root growth may therefore affect shoot growth by means other than water and nutrient supply. (orig./vhe)

1958 (INIS-mf–15065, pp. 405-414) **Reaction and interaction of mycorrhizae and rhizosphere.** Kottke, I. (Tuebingen Univ. (Germany). Inst. fuer Botanik, Spezielle Botanik, Mykologie). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Mycorrhizae of forest trees react and interact in a sensitive manner to environmental stress but have evolved adaption mechanism. Soil acidification causes no reduction of mycorrhizal frequency but shorter life span which is frequently compensated for by a higher production rate of mycorrhizae. Mycorrhizae of Norway spruce preferentially develop in soil pores. Nutrient availability probably relies more on the exchangeable ions at the surfaces of the pores than on the total ion exchange capacity. Additionally, organically bound compounds are mobilized by fungal hyphae and interaction on the rhizoplane. A lack of soil pores results in severe difficulties for Norway spruce to penetrate soil and to maintain mycorrhizal acticity. Water stress in the top soil causing a high percentage of dormant and dead mycorrhizae can be compensated for by a higher mycorrhizal production in deeper soil layers. At low nutrient availability in the mineral soil preferentially development of mycorrhizae is observed in the organic layer that may be regarded as an internal regulation mechanism, not as a toxic effect caused by Al in the mineral soil. Differentiated hyphal mantles protect mycorrhizae against water stress by impermeability and enhanced trehalose content and serve as storage and detoxification organs. There are indications of mycorrhizal types specially adapted to acidified soil conditions. (orig./vhe)

1959 (INIS-mf–15065, pp. 415-430) **Effect of acid deposition on soil animals and microorganisms: influence on structures and processes.** Schaefer, M. (Goettingen Univ. (Germany). 2. Zoologisches Inst., Abt. Oekologie). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Principal effects of acid stress on the soil subsystem are increase or decrease in faunal and microfloral populations, changes in species assemblages and overall reductions in several soil microbiological processes. Little is known about the effects on nitrogen transformation (ammonification, nitrification, denitrification). Some possible but hypothetical scenarios for the effect of acidification stress on the forest ecosystem level are: (1) Inhibition of decomposition leads to an accumulation of litter. Immission and other disturbances may lead to humus disintegration and nitrate leaching; (2) Inhibition of mineralization reduces the availability of plant nutrients; (3) Decrease of the microfauna may cause disturbances of matter microcycling in the root zone; (4) Increase of the mesofauna may enhance the gracing pressure on mycorrhizal mycelia for even fine roots; (5) Decrease of the macrofauna (especially earthworms) lead to less bioturbation which impairs the buffer capacity of the litter and topsoil. A general outcome of liming experiments is stimulation of decomposition and mineralization: (1) Increased in nutrient arailability could lead to increased productivitiyin nutrient limited stands; (2) More irregular effects of animals on microbial activity may result in low stability of the soil-litter system and high liability to perturbations. (orig./vhe)

1960 (INIS-mf–15065, pp. 431-443) **Microscopical aspects of foliar alterations in declining trees.** Fink, S. (Inst. fuer Biologie 1, Tuebingen Univ. (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Several hypotheses have been put forward with regard to current forest decline which concentrate upon observed microscopical changes of needles or leaves from affected trees: (1) Reduced

stomatal transpiration resulting from plate-like fusions of the fibrillar waxes in the epistomatal chambers in needles thought to be provoked by the impact of ozone and acid precipitation; (2) Increased cuticular transpiration: in addition to the fusion of stomatal waxes, the surface waxes are disintegrated and eroded at an enhanced velocity under the influence of acidic or NH4+-containing precipitation; (3) Increased leaching of nutrients: the degradation of cuticular waxes by atmospheric pollutants leads to an increased wettability of the needles and leaves; (4) Surface changes increase susceptibility for biotic injections; (5) Loss of regulative capacity of stomata: partial delignification of the walls of guard cells and subsidiary cells by the impact of SO_2 or O_3 is thought to disturb the control capacity of the stomata for hydroregulation; (6) Direct damage to membranes by O_3/SO_2: the degradation of thylakoids in chloroplasts of affected trees as a direct effect of long-term impact of O3 and/or SO2; (7) Indirect inhibition of transport by O_3 and SO_2 2x: exposure to this combination of pollutants reduces the number of mesophyll and vascular cells in newly developing foliage; (8) Soil/root changes affect needles by disturbing mineral nutrition: specific histological changes in yellowing needles can be attributed exclusively to mineral deficiencies arising by an interaction of soil acidification, increased input of nitrogen, and climatic factors. (orig./vhe)

1961 (INIS-mf–15065, pp. 445-478) **Reactions of tree species to air pollutants under controlled conditions.** Guderian, R. (Inst. fuer Angewandte Botanik, Fachbereich 9, Univ.-GHS Essen (Germany)); Klumpp, A.; Klumpp, G. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

In controlled fumigation experiments of the duration of several weeks to months, realistic concentrations of O_3, SO_2 and BNO_2 trigger verifiable growth impairment as well as phenomenological, histological, physiological and biochemical changes in forest trees. The particular phytotoxic hazard potential of combinations of gaseous pollutants owing to additive and synergistic effects is thereby substantiated. The current immission situation in central and western Europe calls for particular attention to be given to NO_2: it not only plays a part in acid precipitation and as a precivisor of photo-oxidants, but can, moreover, intesify the effect of O_3 and SO_2 pollution. Comparison with case studies in the field reveals numerous parallels between changes observed during controlled fumigation experiments and in damaged forest stands. Problems in the interpretation of results from field studies and demands on future fumigation experiments are discussed. (orig.)

1962 (INIS-mf–15065, pp. 479-497) **Importance of the genetic structure in tree species for forest ecosystems under the influence of air pollutants.** Scholz, F. (Inst. of Forest Genetics and Forest Tree Breeding, Federal Research Centre for Forestry and Forest Products, Grosshansdorf (Germany)). Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Concerning natural stress factors, many investigations support the hypothesis that high genetic diversity causes high adaptedness and adaptability to natural heterogeneous environmental conditions. Air pollution and forest decline give rise to test this hypothesis also for anthropogeneous stress factors and to prove whether selective processes by air pollutants can reduce genetic diversity. Some results are discussed. Heterozygosity is not only advantageous for survival under current natural environmental conditions but also under anthropogeneously changed environments. Plant populations with higher genetic diversity survive better but the danger of genetic loss is not excluded. The more uniform forest ecosystems become due to anthropogeneous influences, the greater is the tendency to loss genetic miltiplicity. Air pollutants, even at concentrations which generate only low damages which seems to be neglectable in the present tree generation, may in the long run impair genetic multiplicity by making the naturally heterogeneous environmental structure continuously more homogeneous due to their large range occurence. (vhe)

1963 (INIS-mf–15065, pp. 499-516) **The response of leaves to potentially acidic gases.** Heber, U. (Inst. of Botany and Pharmaceutical Biology, Wuerzburg Univ. (Germany)); Yin Zuhua; Dittrich, A.; Pfanz, H.; Lange, O.L. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

The gaseous air pollutants SO_2 and NO_2 enter leaves through open stomata. In combination, they are more inhibitory than expected on the basis of their individual toxicity. They can be detoxified in the mesophyll by reduction or oxidation. The capacity for reductive detoxification is high for NO_2 and much lower for SO_2. As products of detoxification are incorporated into proteins, the effectiveness of detoxification are incorporated into proteins, the effectiveness of detoxification depends on protein synthesis which is decreased when growth is retarded under mineral deficiency or at low temperatures. Oxidative detoxification of SO_2 and NO_2 burdens the cells with protons and sulfate or nitrate anions. Anion toxicity is prevented by anion sequestration in vacuoles. Acidification must be met by the metabolic mobilization of base which is slowed down at low temperatures. Base mobilization is affected under conditions of mineral deficiency which is often assumed to be a causative factor in forest decline. Our data show that mineral deficiency which retards growth also increases the cellular sensitivity to gaseous air pollutants such as SO_2 and NO_2. (orig.)

1964 (INIS-mf–15065, pp. 517-525) **Early biochemical effects of air pollutants: detection and possible significance for forest trees.** Sandermann, H. Jr. (GSF-Muenchen, Neuherberg (Germany). Inst. fuer Biochemische Pflanzenpathologie); Heller, W.; Langebartels, C. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122–: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Some general aspects of early diagnostic tests for air pollutants are considered, as are the possible functional role of the apoplast compartment and the new method of whole-needle electrophoresis. The induction of distinct stress proteins, of the diamine putrescine, of stilbene phytoalexins, of catechin, an of cinnamyl alcohol dehydrogenase as well as stilbene and chalcone synthase activities have recently been detected as early biochemical effects of ozone in conifer needles. Metabolic changes induced by ozone in spruce, pine and beech persisted over several months as indicated by the delayed development of visible ozone symptoms. This 'memory' effect may necessitate a re-assessment of the significance of ambient ozone levels. (orig.)

1965 (INIS-mf–15065, pp. 527-550) **Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge.** Pfanz, H. (Inst. of Botany and Pharmaceutical Biology, Wuerzburg Univ. (Germany)); Weikert, R.; Heber, U.; Lange, O.L. Forschungsbeirat Waldschaeden/Luftverunreinigungen

der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

Symptoms of the decline in Norway spruce in the Fichtelgebirge are photosensivity and loss pigments of the photosynthetic apparatus of the needles, as well as their reduced photosynthetic capacity and carboxylation efficiency. Those symptoms do not occur, or even disappear, when measures are taken to prevent Mg(2+) deficiency in the needles. With damaged trees, Mg was found to be withdrawn from the older needles by the competition of the new flush. This withdrawal of nutrients results in the depression of photosynthetic activity. There is a close relationship between the viability of trees and their ability to mobilize essential nutrients. Futhermore, exposure of needles to the direct impact of air pollutants even at relatively low concentrations might be critical for weaked trees. Mg(2+)-deficient needles become photosensitive in their photosynthetic apparatus. Pigment bleaching of sun-exposed needles is a typical symptom of damage. Light generates reductants and oxidants. Those oxidants that are not used for the oxidation of water must be prevented for oxidizing essential parts of the photosynthetic machinery. Chloroplasts have at their disposal an arsenal of agents, which serve to protect them against photooxidation. Pigment bleaching of Mg(2+)-deficient needles in the light shows that these agents can no longer provide full protection against such photooxidative reactions. O_3 and SO_2 are contributing to the decline of mineral-deficient trees. (orig./vhe)

1966 (INIS-mf--15065, pp. 551-565) **Modelling nutrition and growth in pollution research.** Ingestad, T. (Dept. of Ecology and Environmental Research, Swedish Univ. of Agricultural Sciences, Uppsala (Sweden)); Agren, G.I. Forschungsbeirat Waldschaeden/Luftverunreinigungen der Bundesregierung und der Laender (Germany); Kernforschungszentrum Karlsruhe GmbH (Germany). 1989. 575p. Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). (CONF-8910122--: International congress on forest decline research: state of knowledge and perspectives, Friedrichshafen (Germany), 2-6 Oct 1989). In *International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings.* Order Number DE95716296. Source: OSTI; NTIS (US Sales Only); INIS.

General relationships between mineral nutrition and growth of plants have been derived and, for application in experiments, only a few, well-defined plant parameters are needed. Thus, the relationships can be used to maintain plant performance at specified levels and experiments can be carried out, in the laboratory as well as in the field, for better understanding of the processes that determine fertilizer efficiency, soil fertility and maximum growth and that cause limitations because of influences (natural and anthropogenic) on nutrition and other growth factors. Especially in connection with irrigation, small, daily fertilizer additions can be made to increase the continuous nutrient flux in the soil and increased soil fertility can thereby be simulated. The addition of water also reduces the influence and interactions caused by water deficits. In pollution research, two features of the model are of special interest, (1) the establishment of crop performance and growth limitations when nutrient availability is made non-limiting (optimum nutrition and maximum growth) and (2) the use of model parameters to analyse and locate disturbances and limitations of plant performances, e.g. of nutrient productivity (disturbance at canopy level) or of nutrient uptake rate (disturbance at root level). (orig.)

1967 (LA-UR--94-3210) **Inhibition of mitotic-specific histone phophorylation by sodium arsenite.** Cobo, J.M. (Universidad de Alcala de Henares, Madrid (Spain)); Valdez, J.G.; Gurley, L.R. Los Alamos National Lab., NM (United States). [1994]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409234--1: Toxicology in vitro workshop, Cartausi (Switzerland), 20-23 Sep 1994). Order Number DE95000933. Source: OSTI; NTIS; GPO Dep.

Synchronized cultures of Chinese hamster cells (line CHO) were used to measure the effects of 10μM sodium arsenite on histone phosphorylation. This treatment caused cell proliferation to be temporarily arrested, after which the cells spontaneously resumed cell proliferation in a radiomimetric manner. Immediately following treatment, it was found that sodium arsenite affected only mitotic-specific HI and H3 phosphorylations. Neither interphase, nor mitotic, H2A and H4 phosphorylations were affected, nor was interphase HI Phosphorylation affected. The phosphorylation of HI was inhibited only in mitosis, reducing HI phosphorylation to 38.1% of control levels, which was the level of interphase HI phosphorylation. The phosphorylation of both H3 variants was inhibited in mitosis, the less hydrophobic H3 to 19% and the more hydrophobic H3 to 24% of control levels. These results suggest that sodium arsenite may inhibite cell proliferation by interfering with the cyclin B/$p34^{cdc2}$ histone kinase activity which is thought to play a key role in regulating the cell cycle. It has been proposed by our laboratory that HI and H3 phosphorylations play a role in restructuring interphase chromatin into metaphase chromosomes. Interference of this process by sodium arsenite may lead to structurally damaged chromosomes resulting in the increased cancer risks known to be produced by arsenic exposure from the environment.

1968 (ORNL/CDIAC--70) **Direct effects of atmospheric CO_2 enrichment on plants and ecosystems: An updated bibliographic data base.** Strain, B.R. (Duke Univ., Durham, NC (United States). Dept. of Botany); Cure, J.D. (eds.); Cushman, R.M. (comp.). Oak Ridge National Lab., TN (United States). Carbon Dioxide Information Analysis Center. Jun 1994. 293p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95003060. Source: OSTI; NTIS; GPO Dep.

Environmental Sciences Division publication number 4253.

This publication provides bibliographic citations and abstracts on recent literature concerning the direct effects of elevated atmospheric concentrations of carbon dioxide (CO_2) on plants and ecosystems. This report is an update to Direct Effects of Atmospheric CO_2 Enrichment on Plants and Ecosystems: A Bibliography with Abstracts (ORNL/CDIC-13), also by Boyd R. Strain and Jennifer D. Cure, which was published in 1986. The updated bibliography provides complete bibliographic citations, abstracts, keywords, and common and scientific plant names for approximately 800 references published between 1980 and 1994 (half the cited references were published in 1990 or later). Many of the papers included in this volume, particularly papers from Europe, reflect a renewed interest in growth analysis as a way of studying allocation of mass and energy to the various organ systems. A large proportion of the recent research has focused at a level of organization beyond the individual organism.

1969 (PNL--9990) **Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River.** Geist, D.R.; Poston, T.M.; Dauble, D.D. Battelle Pacific Northwest Lab., Richland, WA (United States). Oct 1994. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95001924. Source: OSTI; NTIS; INIS; GPO Dep.

Past operations of Hanford Site facilities have contaminated the groundwater adjacent to the Hanford Reach of the Columbia River, Washington, with various chemical and radiological constituents. The groundwater is hydraulically connected to the river and contains concentrations of contaminants that sometimes exceed federal and/or state drinking water standards or standards for the protection of aquatic life. For example, concentrations of chromium in shoreline seeps and springs at most 100 Area operable units exceed concentrations found to be toxic to fish. Nitrate and tritium concentrations in shoreline seeps are generally below drinking water standards and concentrations potentially toxic to aquatic life, but nitrate concentrations may be high enough to synergistically interact with and exacerbate chromium toxicity. The Hanford Reach also supports the largest run of fall chinook salmon (Oncorhynchus tshawytscha) in the Columbia River Basin. Numbers of fall chinook salmon returning to the Hanford Reach have increased relative to other mainstem populations during the last 30 years. Groundwater

discharge appears to occur near some salmon spawning areas, but contaminants are generally not detectable in surface water samples. The concentration and potential toxicity of contaminants in the interstitial waters of the substrate where fall chinook salmon embryogenesis occurs are presently unknown. New tools are required to characterize the extent of groundwater contaminant discharge to the Hanford Reach and to resolve uncertainties associated with assessment of potential impacts to fall chinook salmon.

5604 Other Environmental Pollutant Effects

1970 (DOE/EE–0036) **Implementation plan for engineering research, development and demonstration.** USDOE Assistant Secretary for Energy Efficiency and Renewable Energy, Washington, DC (United States). Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002273. Source: OSTI; NTIS; GPO Dep.

This document contains information on the planned implementation of the EMF RAPID Program's engineering activities. It describes the approach and specific projects required to achieve the goals laid out in the EMF Engineering Research component of the Research Agenda and Communication Plan. In addition to efforts funded by the RAPID Program, ongoing quality assurance and dosimetry research currently funded by the DOE EMF Biological Mechanisms Research Program are considered essential to achieving the goals of the RAPID Program.

57 HEALTH AND SAFETY

1971 (LA-UR–94-3124) **NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers.** Phipps, C.R. (Los Alamos National Lab., NM (United States). Chemical Science and Technology Div.); Michaelis, M.M. Los Alamos National Lab., NM (United States). [1994]. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409226–1: ECLIM 23: laser interaction with matter, Oxford (United Kingdom), 19-23 Sep 1994). Order Number DE95000863. Source: OSTI; NTIS; GPO Dep.

Several kinds of Near-Earth objects exist for which one would like to cause modest orbit perturbations, but which are inaccessible to normal means of interception because of their number, distance or the lack of early warning. For these objects, LISP (Laser Impulse Space Propulsion) is an appropriate technique for rapidly applying the required mechanical impulse from a ground-based station. In order of increasing laser energy required, examples are: (1) repositioning specially prepared geosynchronous satellites for an enhanced lifetime, (2) causing selected items of space junk to re-enter and burn up in the atmosphere on a computed trajectory, and (3) safely deflecting Earth-directed comet nuclei and earth-crossing asteroids (ECA's) a few tens of meters in size (the most hazardous size). They will discuss each of these problems in turn and show that each application is best matched by its own matrix of LISP laser pulse width, pulse repetition rate, wavelength and average power. The latter ranges from 100W to 3GW for the cases considered. They will also discuss means of achieving the active beam phase error correction during passage through the atmosphere and very large exit pupil in the optical system which are required in each of these cases.

58 GEOSCIENCES

Refer also to citation(s) 145, 288, 1301, 1304, 1454, 1456

1972 (LA-UR–94-2739) **Fractal nature and scaling of normal faults, Rio Grande rift, NM: Implications for growth and strain.** Carter, K.E. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410196–1: Faults populations meeting, Edinburgh (United Kingdom), 17-21 Oct 1994). Order Number DE94018261. Source: OSTI; NTIS; GPO Dep.

In this paper I introduce a suite of Quaternary normal faults from within an active continental rift and characterize the nature of the relationship between fault dimensions. I address the statistical and geological significance of the fractal analysis used in that characterization and discuss the tectonic implications. Specifically, I suggest (1) scaling laws for a previously unanalyzed population of young normal faults in rift environment; (2) implications for fault growth models in this area, in particular, addressing self-similar growth implied from the population; and (3) estimates for the total strain in this part of the basin, considering the contribution of small to unobserved faults.

1973 (UCRL-CR–117756) **Computer programs for analysis of geophysical data.** Rozhkov, M.; Nakanishi, K. Lawrence Livermore National Lab., CA (United States). Jun 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95002472. Source: OSTI; NTIS; INIS; GPO Dep.

This project is oriented toward the application of the mobile seismic array data analysis technique in seismic investigations of the Earth (the noise-array method). The technique falls into the class of emission tomography methods but, in contrast to classic tomography, 3-D images of the microseismic activity of the media are obtained by passive seismic antenna scanning of the half-space, rather than by solution of the inverse Radon's problem. It is reasonable to expect that areas of geothermal activity, active faults, areas of volcanic tremors and hydrocarbon deposits act as sources of intense internal microseismic activity or as effective sources for scattered (secondary) waves. The conventional approaches of seismic investigations of a geological medium include measurements of time-limited determinate signals from artificial or natural sources. However, the continuous seismic oscillations, like endogenous microseisms, coda and scattering waves, can give very important information about the structure of the Earth. The presence of microseismic sources or inhomogeneities within the Earth results in the appearance of coherent seismic components in a stochastic wave field recorded on the surface by a seismic array. By careful processing of seismic array data, these coherent components can be used to develop a 3-D model of the microseismic activity of the media or images of the noisy objects. Thus, in contrast to classic seismology where narrow windows are used to get the best time resolution of seismic signals, our model requires long record length for the best spatial resolution.

1974 (UCRL-JC–115131) **Model-based inversion for a shallow ocean application.** Candy, J.V. (Lawrence Livermore National Lab., CA (United States)); Sullivan, E.J. Lawrence Livermore National Lab., CA (United States). Mar 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9406241–1: Inversion methods in ocean and seismic acoustics conference, La Spezia (Italy), 27 Jun 1994). Order Number DE94016968. Source: OSTI; NTIS; GPO Dep.

A model-based approach to invert or estimate the sound speed profile (SSP) from noisy pressure-field measurements is discussed. The resulting model-based processor (MBP) is based on the state-space representation of the normal-mode propagation model. Using data obtained from the well-known Hudson Canyon experiment, a noisy shallow water ocean environment, the processor is designed and the results compared to those predicted using various propagation models and data. It is shown that the MBP not only predicts the sound speed quite well, but also is able to simultaneously provide enhanced estimates of both modal and pressure-field measurements which are useful for localization and rapid ocean environmental characterization.

66 PHYSICS

6610 General Physics

Refer also to citation(s) 1330

1975 (JINR-E–2-94-138) **Incompatibility of the generally accepted definition of a moving scale length with interval Lorentz invariance.** Khvastunov, M.S.; Strel'tsov, V.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 3p. Order Number DE95605250. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the generally accepted condition of simultaneity of end marks of a moving scale when its length is measured is incompatible with interval Lorentz invariance. As known, a direct consequence of this condition is the contraction of the longitudinal sizes of moving objects. It is stressed that the non-covariance of energy and momentum of the electromagnetic field of a moving charge is just conditioned by the non-covariance of contracted length. 5 refs. (author).

1976 (JINR-E-2-94-153) **Wormhole on the Lobachevsky background.** Tentyukov, M.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 6p. Order Number DE95605251. Source: OSTI; NTIS (US Sales Only); INIS.

The exact spherical symmetric static solution of Rosen like equations of the bi metric theory is investigated. The background metric is not flat, but curved, with the Lobachevsky spatial sections and 'cosmic time' c^2 d t^2. There are two branches of the solution. The first is similar to the Schwarzschild solution and turns to it when the Lobachevsky constant goes to ∞, while the second describes the traversable wormhole and has no Einstein limit. 5 refs.; 5 figs.(author).

6611 Classical and Quantum Mechanics

Refer also to citation(s) 2041, 2045

1977 (IC–94/53) **Nonexistence of global solutions to some quasilinear hyperbolic equations with dynamic boundary conditions.** Kirane, M. (International Centre for Theoretical Physics, Trieste (Italy)); Kouachi, S.; Tatar, N. International Centre for Theoretical Physics, Trieste (Italy). Mar 1994. 7p. Order Number DE95607010. Source: OSTI; NTIS (US Sales Only); INIS.

In this work, the non-existence of the global solutions to two fourth-order hyperbolic equations with dynamic boundary conditions is considered. The method of proof makes use of the generalized convexity method due to Ladyzhenskaya and Kalantarov. (author). 12 refs.

1978 (IC–94/107) **Describing the macroscopic world: Closing the circle within the dynamical reduction program.** Ghirardi, G.C. (International Centre for Theoretical Physics, Trieste (Italy)); Grassi, R.; Benatti, F. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 37p. Order Number DE95606997. Source: OSTI; NTIS (US Sales Only); INIS.

With reference to recently proposed theoretical models accounting for reduction in terms of a unified dynamics governing all physical processes we analyze the problem of working out a world view accommodating our knowledge about natural phenomena. We stress the relevant conceptual differences between the considered models and standard quantum mechanics. In spite of the fact that both theories describe systems within a genuine Hilbert space framework, the peculiar features of the spontaneous reduction models limit drastically the states which are dynamically stable. This fact by itself allows one to work out an interpretation of the formalism which makes possible to give a satisfactory description of the world in terms of the values taken by an appropriately defined mass density function in ordinary configuration space. A topology based on this function and which is radically different from the one characterizing the Hilbert space is introduced and in terms of it the ideal of similarity of macroscopic situations is precisely defined. Finally, the formalism and the interpretation are shown to yield a natural criterion for establishing the psycho-physical parallelism. The conclusion is that, within the considered theories and at the nonrelativistic level, one can satisfy all sensible requirements for a completely satisfactory macro-objective description of reality. (author). 21 refs, 1 fig.

1979 (IC–94/128) **"Charge-Dyon" system as the reduced oscillator.** Nersessian, A. (International Centre for Theoretical Physics, Trieste (Italy)); Antonian, V. ter. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 4p. Order Number DE95606998. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown, that in the general case the Kustaanheimo-Stiefel transformation (reduction of 4d oscillator on the Twistor space by the Hamiltonian action of U(1) with further time-reparametrization) leads to the integrable system, describing the motion of a spinless electrically charged particle in the dyon field. (author). 6 refs.

1980 (IC–94/135) **On Segal-Wilson's construction for the τ-functions of the constrained KP hierarchies.** Zhang You-jin. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 15p. Order Number DE95606999. Source: OSTI; NTIS (US Sales Only); INIS.

In this letter we study the constrained KP hierachies by employing Segal-Wilson's theory on the τ-functions of the KP hierarchy. We first describe the elements of the Grassmannian which correspond to solutions of the constrained KP hierarchy, and then we show how to construct its rational and soliton solutions from these elements of the Grassmannian. (author). 10 refs.

1981 (IC–94/136) **On the Cohen-Macaulayness and Gorensteinness of integral closure filtrations Rees algebras of height-two equimultiple ideals.** Duong Quoc Viet. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 12p. Order Number DE95607000. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper we give the criteria for an integral closure filtration Rees algebra R(I)-bar of height-two equimultiple ideal I in terms of a basic ring and an ideal I. From these criteria we obtain interesting information on the structure of a basic ring and an ideal I, when Rees algebra R(I)-bar is a Cohen-Macaulay or Gorenstein ring. (author). 10 refs.

1982 (IC–94/143) **Regge in the sky: Origin of the cosmic rotation.** Muradian, R. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 8p. Order Number DE95607001. Source: OSTI; NTIS (US Sales Only); INIS.

Observed universal spin and mass relationship for a wide range of astronomical objects are described by two extended Regge trajectories: disc-trajectory for stars and planets, and ball-trajectory for galaxies and their clusters. The cosmic Chew-Frautschi plot is presented and two fundamental points are revealed on it: Eddington and Chandrasekhar points with coordinates expressed via combinations of the fundamental constants. (author). 17 refs, 3 figs.

1983 (IC–94/152) **Strong phase correlations of solitons of nonlinear Schroedinger equation.** Litvak, A.G. (Russian Academy of Sciences, Novgorod (Russian Federation). Inst. of Applied Physics); Mironov, V.A.; Protogenov, A.P. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 11p. Order Number DE95607002. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the possibility to suppress the collapse in the nonlinear 2+1 D Schroedinger equation by using the gauge theory of strong phase correlations. It is shown that invariance relative to q-deformed Hopf algebra with deformation parameter q being the fourth root of unity makes the values of the Chern-Simons term coefficient, k=2, and of the coupling constant, g=1/2, fixed; no collapsing solutions are present at those values. (author). 21 refs.

1984 (IC–94/153) **The criteria for the Cohen-Macaulayness and Gorensteiness of Rees algebras of ideals having positive analytic deviation.** Duong Quoc Viet. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 13p. Order Number DE95607003. Source: OSTI; NTIS (US Sales Only); INIS.

This paper investigates the relationships between the maximal reduction number and q-invariant of a graded ring in the case of Rees ring being a Cohen-Macaulay or Gorenstein ring. From these relationships we give the criteria for Rees algebra of the ideal I having arbitrary analytic deviation to be Cohen-Macaulay and Gorenstein in terms of associated graded ring and maximal reduction number of I. (author). 16 refs.

1985 (IC–94/158) **Nonlinearity induced nontrivial dynamics in the Jaynes-Cummings Hamiltonian.** Gruver, J.L. (International Centre for Theoretical Physics, Trieste (Italy)); Aliaga, J.; Cerdeira, H.A.; Proto, A.N. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 15p. Order Number DE95607004. Source: OSTI; NTIS (US Sales Only); INIS.

The addition of a nonlinear term to the Jaynes-Cummings Hamiltonian induced a nontrivial discrete dynamics for the number of possible transitions of a given order, represented by a Fibonacci series. We describe the physics of the problem in terms of relevant operators which close a semi-Lie algebra under commutation with

the Hamiltonian and therefore extending the generalized Bloch equations, already obtained for the linear case, to the non-linear one. The initial conditions as well as a thermodynamical treatment of the problem is analyzed via the maximum entropy principle density operator. Finally, a generalized solution for the time-dependent case is obtained and the solution for the field in a thermal state is recovered. (author). 20 refs, 1 fig.

1986 (IC–94/165) **Testing quantum behaviour at the macroscopic level.** Ghirardi, G.C. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 14p. Order Number DE95607005. Source: OSTI; NTIS (US Sales Only); INIS.

We reconsider recent proposals to test macro realism versus quantum mechanics in experiments involving noninvasive measurement processes on a Squid. In spite of the fact that we are able to prove that the proposed experiments do not represent a test of macro realism but simply of macroscopic quantum coherence we call attention to their extreme conceptual relevance. We also discuss some recent criticisms which have been raised against the considered proposal and we show that they are not relevant. (author). 12 refs.

1987 (IC–94/171) **Recoil effects in quantum topological solitons.** Aldabe, F. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 6p. Order Number DE95607006. Source: OSTI; NTIS (US Sales Only); INIS.

We enlarge the space of dynamical variables to include the collective coordinate defining the position of the quantum topological soliton. The leading order correction arising from this treatment allows us to confirm that the energy of the soliton varies covariantly to lowest order for certain types of self interacting potentials. Upon imposing conservation of statistics we find that the allowed momenta is quantized. A Yukawa coupling appears as a consequence of diagonalizing the Hamiltonian of the mesons. These results along with its quantum nature proposes the quantum topological solitons as excellent candidates for nuclear physics at intermediate energies. (author). 6 refs.

1988 (IC–94/189) **On connection of q-deformed para oscillators with para oscillators.** Ha Huy Bang. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 7p. Order Number DE95607007. Source: OSTI; NTIS (US Sales Only); INIS.

The connection of q-deformed para-Bose oscillators with para-Bose oscillators is determined. From this, the most general commutation relations for q-deformed para-Bose oscillator are constructed. (author). 12 refs.

1989 (IC–94/192) **Dissipative quantum mechanics: The generalization of the canonical quantization and von Neumann equation.** Tarasov, V.E. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 18p. Order Number DE95607008. Source: OSTI; NTIS (US Sales Only); INIS.

Sedov variational principle, which is the generalization of the least actional principle for the dissipative processes is used to generalize the canonical quantization and von Neumann equation for dissipative systems (particles and strings). (author). 66 refs, 1 fig.

1990 (IC–94/204) **Quantum symplectic geometry. 1. The matrix Hamiltonian formalism.** Djemai, A.E.F. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 80p. Order Number DE95607009. Source: OSTI; NTIS (US Sales Only); INIS.

The main purpose of this work is to describe the quantum analogue of the usual classical symplectic geometry and then to formulate the quantum mechanics as a (quantum) non-commutative symplectic geometry. In this first part, we define the quantum symplectic structure in the context of the matrix differential geometry by using the discrete Weyl-Schwinger realization of the Heisenberg group. We also discuss the continuous limit and give an expression of the quantum structure constants. (author). 42 refs.

1991 (INIS-mf–14386, pp. WP60) **Relativistic quantum mechanics in a periodic potential.** Forsyth, A.G. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Smith, A.E. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 5 refs. SCATTERING/dirac equation; SCATTERING/perturbation theory; SOLIDS/electron microscopy; SOLIDS/scattering; ANALYTICAL SOLUTION; BRAGG CURVE; BRILLOUIN EFFECT; ELECTRON GAS; FREE ENERGY; POTENTIALS; QUANTUM MECHANICS; SCATTERING; SCHROEDINGER EQUATION; SOLIDS

1992 (IPNO-TH–93-11) **Trace formula for Riemann surfaces with magnetic field.** Comtet, A.; Georgeot, B.; Ouvry, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jul 1993. 15p. Order Number DE95607011. Source: OSTI; NTIS (US Sales Only); INIS.

The Maass operator for automorphic forms is interpreted as the Hamiltonian of a charged particle moving in a constant magnetic field on a Riemann surface of constant negative curvature. A careful analysis of the classical trajectories in the presence of the magnetic field shows that the action on a periodic orbit is related to the action on a free periodic geodesic. This identification provides a semiclassical interpretation of the Selberg-Maass trace formula for automorphic forms. (authors). 14 refs., 1 fig.

1993 (IPNO-TH–93-44) **Statistical properties of the zeros of zeta functions - beyond the Riemann case.** Bogomolny, E.; Leboeuf, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Sep 1993. 26p. Order Number DE95607012. Source: OSTI; NTIS (US Sales Only); INIS.

The statistical distribution of the zeros of Dirichlet L-functions is investigated both analytically and numerically. Using the Hardy-Littlewood conjecture about the distribution of primes it is shown that the two-point correlation function of these zeros coincides with that for eigenvalues of the Gaussian unitary ensemble of random matrices, and that the distributions of zeros of different L-functions are statistically independent. Applications of these results to Epstein's zeta functions are shortly discussed. (authors) 30 refs., 3 figs., 1 tab.

1994 (IPNO-TH–93-62) **Coding chaotic billiards. Pt. 2: Compact billiards tiling the pseudosphere.** Giannoni, M.J.; Ullmo, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 9 Nov 1993. [54p.] Order Number DE95607013. Source: OSTI; NTIS (US Sales Only); INIS.

A method was proposed earlier to derive exact symbolic dynamics for polygonal billiards defined on a negative curvature surface, whose all vertices lie at infinity. This method is now extended to the case of compact billiards tiling the Poincare disk, using elementary tools such as the bounce mapping. An exact coding is derived also in this case. Furthermore, some results are obtained without using the tiling property. They allow to tackle the more complicated case of non-tiling billiards. (authors). 18 refs., 13 figs.

1995 (IPNO-TH–93-63) **Coding chaotic billiards. Pt. 3: Non-tiling billiards defined on the pseudosphere.** Ullmo, D.; Giannoni, M.J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 9 Nov 1993. 38p. Order Number DE95607014. Source: OSTI; NTIS (US Sales Only); INIS.

Non-tiling compact billiard defined on the pseudosphere is studied 'a la Morse coding'. As for most bounded systems, the coding is non exact. However, two sets of approximate grammar rules can be obtained, one specifying forbidden codes, and the other allowed ones. In-between some sequences remain in the 'unknown' zone, but their relative amount can be reduced to zero if one lets the length of the approximate grammar rules goes to infinity. The relationship between these approximate grammar rules and the 'pruning front' introduced by Cvitanovic et al. is discussed. (authors). 13 refs., 10 figs., 1 tab.

1996 (IPNO-TH–93-71) **On δ perturbative interactions in the Aharonov-Bohm and Anyon models.** Ouvry, S. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire). Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Nov 1993. 11p. Order Number DE95607015. Source: OSTI; NTIS (US Sales Only); INIS.

The validity and equivalence of various perturbative approaches for the Aharonov-Bohm and Anyon models are discussed. There are three perturbative approaches to be considered: the non-hermitian Hamiltonian, the perturbative approach around a good

Hilbert space and that around a standard Hilbert space. It is shown that the first and third ones are identical. (K.A.). 13 refs.

1997 (IPNO-TH–93-74) **Finite population-size effects in projection Monte Carlo methods.** Cerf, N.; Martin, O.C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Dec 1993. 30p. Order Number DE95607016. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, E (US).

Projection (Green's function and diffusion) Monte Carlo techniques sample a wave function by a stochastic iterative procedure. It is shown that these methods converge to a stationary distribution which is unexpectedly biased, i.e., differs from the exact ground state wave function, and that this bias occurs because of the introduction of a replication procedure. It is demonstrated that these biased Monte Carlo algorithms lead to a modified effective mass which is equal to the desired mass only in the limit of an infinite population of walkers. In general, the bias scales as 1/N for a population of walkers of size N. Various strategies to reduce this bias are considered. (authors). 29 refs., 3 figs.

1998 (IPNO-TH–94-14) **Discrete symmetries in the Weyl expansion for quantum billiards.** Pavloff, N. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. 9p. Order Number DE95607017. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Physics. A, Math. Gen. (GB).

2 and 3 dimensional quantum billiards with discrete symmetries are considered. The boundary condition is either Dirichlet or Neumann. The first terms of the Weyl expansion are derived for the level density projected onto the irreducible representations of the symmetry group. The formulae require only the knowledge of the character table of the group and the geometrical properties (such as surface, perimeter etc.) of sub-parts of the billiard invariant under a group transformation. (author). 17 refs., 1 fig., 1 tab.

1999 (JINR-E–2-94-174) **Constraints, complex structures and quantization.** Popov, A.D. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 23p. Order Number DE95605252. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Journal of Mathematical Physics.

The finite-dimensional phase manifolds M, the Marsden-Weinstein reduction of these manifolds by the Hamiltonian action of a connected Lie group G and the geometric quantization of the reduced manifolds M_G are considered. We study geometry of a Kaehler manifolds for which the action of G on M does not preserve a complex structure J on M, but preserves some family of complex structures. The algorithm of the geometric quantization of such classical systems is described. We discuss in detail the quantization of the flat phase space R^{2n} for the cases when the group G is generated by quadratic first-class constraints. 40 refs. (author).

2000 (JINR-E–2-94-230) **Ellipsoidal basis for isotropic oscillator.** Kallies, W. (Humboldt-Universitaet, Berlin (Germany)); Lukac, I.; Pogosyan, G.S.; Sisakyan, A.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 12p. Order Number DE95605253. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to International Workshop 'Symmetry Methods in Physics', Dubna, 6-10 july 1993.

The solutions of the Schroedinger equation are derived for the isotropic oscillator potential in the ellipsoidal coordinate system. The explicit expression is obtained for the ellipsoidal integrals of motion through the components of the orbital moment and Demkov's tensor. The explicit form of the ellipsoidal basis is given for the lowest quantum numbers. 10 refs.; 1 tab. (author).

2001 (LA-UR–94-3329) **Quantum diffusion.** Habib, S. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409228–1: Drexel conference on quantum non integrability, Philadelphia, PA (United States), Sep 1994). Order Number DE95001015. Source: OSTI; NTIS; INIS; GPO Dep.

We consider a simple quantum system subjected to a classical random force. Under certain conditions it is shown that the noise-averaged Wigner function of the system follows an integro-differential stochastic Liouville equation. In the simple case of polynomial noise-couplings this equation reduces to a generalized Fokker-Planck form. With nonlinear noise injection new "quantum diffusion" terms rise that have no counterpart in the classical case. Two special examples that are not of a Fokker-Planck form are discussed: the first with a localized noise source and the other with a spatially modulated noise source.

2002 (LYCEN–9420) **Limits on the window for halo phenomena.** Fleck, S. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Richard, J.M. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. May 1994. 8p. (ISN–94-54.). Order Number DE95607018. Source: OSTI; NTIS (US Sales Only); INIS.

We study domain of coupling constants for which a 3-body or 4-body system is bound while none of its subsystems is bound. Limits on the size of the domain are derived from a variant of the Hall-Post inequalities which relate N-body to (N-1)-body energies at given coupling. Possible applications to halo nuclei and hypernuclei are briefly outlined. (authors). 15 refs., 2 figs.

2003 (UM-P–93/46) **Asymptotics for the Kummer function of Bose plasmas.** Kowalenko, V. (Australian National Univ., Canberra, ACT (Australia). Dept. of Applied Mathematics); Frankel, N.E. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 31p. Order Number DE95607019. Source: OSTI; NTIS (US Sales Only); INIS.

The asymptotic expansions for the Kummer function obtained in the study of the linear response of magnetised Bose plasmas at T = 0 K are presented for large and small values of its parameter, thereby displaying the function's asymptotic non-uniformity. The large parameter expansion plays a determining role in the behaviour of these Bose systems in the limit that the external magnetic field $B \rightarrow 0$. This particular expansion is generalised herein and its validity tested by determining the asymptotic expansion for the Hurwitz zeta function. 18 refs., 1 tab., 2 figs.

2004 (UM-P–93/50) **Observation of the scalar Aharonov-Bohm effect by neutron interferometry.** Allman, B.E. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Cimmino, A.; Klein, A.G.; Opat, G.I.; Kaiser, H.; Werner, S.A. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 30p. Sponsored by National Science Foundation, Washington, DC (United States). Div. of Physics;Australian Research Council, Canberra, ACT (Australia). Grant no. NSF-PHY-9024608. Order Number DE95607020. Source: OSTI; NTIS (US Sales Only); INIS.

A phase shift for de Broglie waves due to the action of a scalar potential in an otherwise field-free (i.e. force-free) region of space is known as the scalar Aharonov-Bohm (AB) effect. Unlike the more familiar AB effect due to the magnetic vector potential, the scalar effect has hitherto remained unverified due, presumably, to technical difficulties in electron interferometry. An analogous interferometric experiment was performed with thermal neutrons subject to pulsed magnetic fields. The observations were carried out at the University of Missouri Research Reactor, using a skew-symmetric perfect silicon crystal neutron interferometer. The expected phase shifts have been observed to a high degree of accuracy. A detailed description of the experiment and its interpretation is given in this paper. 26 refs., 11 figs.

2005 (UM-P–93/53) **Can we test the many-Hilbert-space approach to quantum mechanics?.** Thomson, M.J. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 10p. Order Number DE95607021. Source: OSTI; NTIS (US Sales Only); INIS.

The differences between the many-Hilbert-space (MHS) and the von Neumann theories of quantum measurement are clarified. In particular, it is shown that recent claims that certain neutron optics experiments indicate in favour of the MHS theory at the expense of the von Neumann theory are mistaken. The question of whether the MHS theory can be falsified is also discussed. It is concluded that the principle difference between the MHS approach to the quantum measurement problem, and the usual von Neumann theory, is the absence of more function collapse in the former and the essential role of random processes in the later. 12 refs., 1 fig.

2006 (UM-P–93/61) **On the effects of gravitational fields on the electrical properties of matter.** Opat, G.I. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 9p. Sponsored by Australian Research Council, Canberra, ACT (Australia). Order Number DE95607022. Source: OSTI; NTIS (US Sales Only); INIS.

A discussion of the electrical state of a conducting solid in a static gravitational field is presented. The analysis of the stress-gravitational force balance inside the solid is complicated, however, outside the solid, in the evanescent electron field, the analysis of such a balance simplifies greatly. As a consequence of this external analysis, an expression for the electric field external to the body is presented which includes the direct effect of gravity on the electrons, as well as the indirect effect due to the stress induced by gravity acting on the bulk solid. Such fields are an important determinant of the gravitational motion of charged particles within metallic shields. 4 refs., 1 fig.

6612 Techniques of General Use in Physics

2007 (LBL–36120) **Laser trapping of ^{21}Na atoms.** Lu, Zheng-Tian. Lawrence Berkeley Lab., CA (United States). Sep 1994. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002354. Source: OSTI; NTIS; INIS; GPO Dep.

This thesis describes an experiment in which about four thousand radioactive ^{21}Na ($t_{1/2}$ = 22 sec) atoms were trapped in a magneto-optical trap with laser beams. Trapped ^{21}Na atoms can be used as a beta source in a precision measurement of the beta-asymmetry parameter of the decay of $^{21}Na \rightarrow {}^{21}Ne + B^{+} + \nu_e$, which is a promising way to search for an anomalous right-handed current coupling in charged weak interactions. Although the number o trapped atoms that we have achieved is still about two orders of magnitude lower than what is needed to conduct a measurement of the beta-asymmetry parameter at 1% of precision level, the result of this experiment proved the feasibility of trapping short-lived radioactive atoms. In this experiment, ^{21}Na atoms were produced by bombarding ^{24}Mg with protons of 25 MeV at the 88 in. Cyclotron of Lawrence Berkeley Laboratory. A few recently developed techniques of laser manipulation of neutral atoms were applied in this experiment. The ^{21}Na atoms emerging from a heated oven were first transversely cooled. As a result, the on-axis atomic beam intensity was increased by a factor of 16. The atoms in the beam were then slowed down from thermal speed by applying Zeeman-tuned slowing technique, and subsequently loaded into a magneto-optical trap at the end of the slowing path. The last two chapters of this thesis present two studies on the magneto-optical trap of sodium atoms. In particular, the mechanisms of magneto-optical traps at various laser frequencies and the collisional loss mechanisms of these traps were examined.

6613 Other Aspects of Physical Science

Refer also to citation(s) 1451, 1988, 2155, 2390

2008 (DESY–94-118) **Canonical formulation of gravitation- and supergravitation theories.** Matschull, H.J. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany); Hamburg Univ. (Germany). Fachbereich 12 - Physik. Jul 1994. 97p. (In German). Order Number DE95711195. Source: OSTI; NTIS (US Sales Only).

In this thesis some recent results concerning canonical formulation and ansaetze for quantization of general relativity are presented, which are related to Ashtekar's variables. In the first part the new variables are introduced on the Lagrangian level. The program of chanonical quantization is applied to gravity and supergravity and some ansaetze for solutions to the constraints are discussed, with special emphasis on the singular metric problem of the so called loop states. The second part is concerned with three dimensional models. For pure N=2 supergravity the complete physical state space is constructed by using the canonical method. Finally, the canonical structure of matter coupled N=2 supergravity is worked out and its quantization and an ansatz for a solution to the constraints is discussed. (orig.)

2009 (DOE/ET/53088–672) **Generalized relaxation theory and vortices in plasmas.** Oliveira, S.R. (Universidade de Brasilia (Brazil). Departamento de Fisica); Tajima, Toshiki. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States);Conselho Nacional de Desenvolvimento Cientifico e Tecnologico (CNPq), Sao Paulo, SP (Brazil). DOE Contract FG05-80ET53088. (IFSR–672). Order Number DE95002615. Source: OSTI; NTIS; INIS; GPO Dep.

The authors present a generalization of the relaxation theory based in the canonical momentum of each species fluid in a multi-component plasma The generalized helicity, as a topological quantity, has a lifetime larger than the lifetime of the energy. The proposed variational principle suggests vortices structures. They study localized solutions, assuming the existence of a separatrix. Two-dimensional and three-dimensional solutions are studied for an electron-positron-proton plasma. Ideal magnetohydrodynamic (MHD) three-dimensional localized vortices are studied as well. Possible cosmological implications are discussed.

2010 (IC–94/54) **Temperature bounds in a model of laminar flames.** Kirane, M. (International Centre for Theoretical Physics, Trieste (Italy)); Badraoui, S. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 4p. Order Number DE95607048. Source: OSTI; NTIS (US Sales Only); INIS.

We consider reaction-diffusion equations coupling temperature and mass fraction in one-step-reaction model of combustion in R^N. Uniform temperature bounds are derived when the Lewis number is less than one. This result completes the case of Lewis number greater than one studied by J.D. Avrin and M. Kirane "Temperature growth and temperature bounds in special cases of combustion models" (to appear in Applicable Analysis). (author). 5 refs.

2011 (IC–94/55) **Behaviour at X=±∞ of solutions to a predator-prey model.** Kirane, M. (International Centre for Theoretical Physics, Trieste (Italy)); Badraoui, S.; Guedda, M. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 13p. Order Number DE95607049. Source: OSTI; NTIS (US Sales Only); INIS.

We consider the behaviour at x=±∞ of solutions to a system of reaction diffusion equations modelling two species in a predator-prey relationship. We show that if the initial data have limits at ±∞, then at ±∞ the solutions will satisfy the free diffusion system for all positive time. (author). 10 refs.

2012 (IC–94/161) **Behaviour of the reaction front for A + B → C diffusion-reactions systems: An analytic approach.** Rodriguez, M.A. (Cantabria Univ., Santander (Spain). Inst. de Astrofisica y Estructura de la Materia); Wio, H.S. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 10p. Order Number DE95607043. Source: OSTI; NTIS (US Sales Only); INIS.

The time behaviour of the reaction front between initially separated reactants of the diffusion-limited reaction A + B → C in a one-dimensional system is studied by means of a generalization of the Galanin approach to extended absorbers. The asymptotic results of this scheme give a rather good agreement with simulations, regarding the time power indexes of scaling for the height and width of the distribution of C particles. (author). 26 refs.

2013 (IC–94/175) **Flare stars and Pascal distribution.** Muradian, R. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 6p. Order Number DE95607044. Source: OSTI; NTIS (US Sales Only); INIS.

Observed statistics of stellar flares are described by Pascal or Negative Binomial Distribution. The analogy with other classes of chaotic production mechanisms such as hadronic particle multiplicity distributions and photoelectron counts from thermal sources is noticed. (author). 12 refs.

2014 (IC–94/180) **The use of empirical models to investigate GPS derived total electron content.** Kartal, S. (International Centre for Theoretical Physics, Trieste (Italy)); Radicella, S.M.; Spalla, P. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 6p. Order Number DE95606045. Source: OSTI; NTIS (US Sales Only); INIS.

Hourly values of two months of Total Electron Content (TEC) calculated from Global Positioning System (GPS) Satellites observations of Doppler effect using a technique developed at the IROE

of Florence, Italy (Ciraolo, 1993) are studied together with simultaneous measurements of Geostationary Satellite Faraday TEC obtained at a different location in Europe. These experimental data are compared with TEC values calculated by using DGR and IRI-90 empirical models of the electron density in the ionosphere based on ionospheric characteristics obtained from vertical sounding at locations near the two places where TEC from satellite observations are obtained. The results show that the correlation of experimental and model data is good in daytime. Night-time values of GPS (TEC) is not well correlated with the model calculations possible indicating that this technique sees an additional distribution of ionization from the one obtained by Faraday observations and the empirical models used. (author). 4 refs, 2 figs, 2 tabs.

2015 (IC–94/184) **Symbolic dynamics of the Lorenz equations.** Fang Hai-ping (Academia Sinica, Beijing, BJ (China). Inst. of Theoretical Physics); Hao Bailin. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 31p. Order Number DE95607045. Source: OSTI; NTIS (US Sales Only); INIS.

The Lorenz equations are investigated in a wide range of parameters by using the method of symbolic dynamics. First, the systematics of stable periodic orbits in the Lorenz equations is compared with that of the one-dimensional cubic map, which shares the same discrete symmetry with the Lorenz model. The systematics is then "corrected" in such a way as to encompass all the known periodic windows of the Lorenz equations with only one exception. Second, in order to justify the above approach and to understand the exceptions, another 1D map with a discontinuity is extracted from an extension of the geometric Lorenz attractor and its symbolic dynamics is constructed. All this has to be done in light of symbolic dynamics of two-dimensional maps. Finally, symbolic dynamics for the actual Poincare return map of the Lorenz equations is constructed in a heuristic way. New periodic windows of the Lorenz equations and their parameters can be predicted from this symbolic dynamics in combination with the 1D cubic map. The extended geometric 2D Lorenz map and the 1D antisymmetric map with a discontinuity describe the topological aspects of the Lorenz equations to high accuracy. (author). 44 refs, 17 figs, 8 tabs.

2016 (IC–94/186) **Quantum mechanical analogy for solving a competitive coexistence model in ecology.** Wio, H.S. (International Centre for Theoretical Physics, Trieste (Italy)); Kuperman, M.N.; Haeften, B. von. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 19p. Order Number DE95607046. Source: OSTI; NTIS (US Sales Only); INIS.

We have studied an ecological system of three species: a strong and a weak one, competing for a single food resource, modelled as a reaction-diffusion process. An exact analytical solution has been found through a quantum mechanical analogy. Such solution indicates that in certain situations the classical results on extinction and coexistence of Lotka-Volterra type equations are no longer valid, essentially, as a consequence of the weak species mobility. A stability analysis of this solution against changes in different parameters has been carried out. (author). 19 refs, 5 figs.

2017 (IC–94/195) **A phase-transition induced by the struggle for life in a competitive coexistence model in ecology.** Wio, H.S. (International Centre for Theoretical Physics, Trieste (Italy)); Kuperman, M.N. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 8p. Order Number DE95607047. Source: OSTI; NTIS (US Sales Only); INIS.

We have studied a spatially homogeneous model of an ecological system consisting of two species: a strong and a weak one, competing for a single food resource. The inclusion of a term corresponding to intraspecies competition, in particular for the strong species, shows that, it a certain threshold value is overcome, the classical result on extinction and coexistence of Lotka-Volterra type equations can drastically change yielding a kind of phase-transition to a coexistence phase. (author). 18 refs, 2 figs.

2018 (INIS-mf–14386, pp. WP26) **Self-organized criticality in magnetization reversal.** Thompson, P.J. (Western Australia Univ., Nedlands, WA (Australia). Dept. of Physics); Street, R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. FERROMAGNETIC MATERIALS/criticality; FERROMAGNETIC MATERIALS/hysteresis; ENERGY LOSSES; CRITICALITY; HYSTERESIS; MAGNETIC FIELD REVERSAL; MAGNETIZATION; MAGNETS; NOISE; PHASE TRANSFORMATIONS

2019 (INIS-mf–14386, pp. WP36) **Classical lattice dynamics: Foreman-Lomer theory and the Blackman sum rule.** Stewart, A.M. (Australian National Univ., Canberra, ACT (Australia). Research School of Physical Sciences). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. CRYSTAL LATTICES/sum rules; PHONONS/eigenfrequency; ANALYTICAL SOLUTION; EIGENVALUES; FOURIER ANALYSIS; PHONONS; EIGENFREQUENCY; SERIES EXPANSION; SPECTRA

2020 (IPNO-TH–93-03) **Bubble nucleation rates in first-order phase transitions.** Cottingham, W.N. (Bristol Univ. (United Kingdom). Dept. of Physics); Kalafatis, D.; Vinh Mau, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 18p. Order Number DE95607050. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, B (US).

A formalism that is sometimes used for estimating bubble nucleation rates in a fluid undergoing a first order phase transition is critically examined. The results are also relevant to phase transitions in general fluids encountered in other fields of physics and chemistry. (K.A.). 10 refs., 1 fig.

2021 (IPNO-TH–93-16) **Equation of state of an anyon gas in a strong magnetic field.** Dasnieres de Veigy, A. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Ouvry, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1993. 14p. Order Number DE95607051. Source: OSTI; NTIS (US Sales Only); INIS.

The statistical mechanics of an anyon gas in a magnetic field is addressed. An harmonic regulator is used to define a proper thermodynamic limit. When the magnetic field is sufficiently strong, only exact N-anyon groundstates, where anyons occupy the lowest Landau level, contribute to the equation of state. Particular attention is paid to the interval of definition of the statistical parameter α is contained in [-1,0] where a gap exists. One finds that at the critical filling $\nu=-1/\alpha$ where the pressure diverges, the external magnetic field is entirely screened by the flux tubes carried by the anyons. (authors). 13 refs.

2022 (IPNO-TH–93-29) **Moments of inertia and the shapes of Brownian paths.** Fougere, F.; Desbois, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 18p. Order Number DE95607052. Source: OSTI; NTIS (US Sales Only); INIS.

To appear in Journal of Physics. A, Mathematical and General (UK).

The joint probability law of the principal moments of inertia of Brownian paths (open or closed) is computed, using constrained path integrals and Random Matrix Theory. The case of two-dimensional paths is discussed in detail. In particular, it is shown that the ratio of the average values of the largest and smallest moments is equal to 4.99 (open paths) and 3.07 (closed paths). Results of numerical simulations are also presented, which include investigation of the relationships between the moments of inertia and the arithmetic area enclosed by a path. (authors) 28 refs., 2 figs.

2023 (IPNO-TH–93-34) **Wetting transitions of classical liquid films: A nearly universal trend.** Cheng, E. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Physics); Cole, M.W.; Saam, W.F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jul 1993. 28p. Order Number DE95607053. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, B (US).

Wetting behavior for the adsorption of Ne, Ar, Kr, and Xe for temperatures above their triple point is calculated. Experimental observations of wetting and prewetting transitions of these simple liquids are predicted. A nearly universal trend in the physical interaction parameters for Ar, Kr and Xe on various substrates is reported. It is shown, that the classical 'law of corresponding states' can be extended to predict approximately universal behavior in the wetting transitions of these films. It is demonstrated, by comparison with Ne, H_2 and He films, that quantum effects enhances wetting in that there is a larger range of adsorption parameters leading to wetting when zero-point motion is included. (authors). 33 refs., 7 figs., 5 tabs.

2024 (IPNO-TH–93-60) **Orbital magnetism in ensembles of ballistic billiards.** Ullmo, D.; Richter, K.; Jalabert, R.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 10p. Order Number DE95607054. Source: OSTI; NTIS (US Sales Only); INIS.

The magnetic response of ensembles of small two-dimensional structures at finite temperatures is calculated. Using semiclassical methods and numerical calculation it is demonstrated that only short classical trajectories are relevant. The magnetic susceptibility is enhanced in regular systems, where these trajectories appear in families. For ensembles of squares large paramagnetic susceptibility is obtained, in good agreement with recent measurements in the ballistic regime. (authors). 20 refs., 2 figs.

2025 (LBL–35929) **Properties of strange-matter stars.** Weber, F. (Univ., of Munich, Theresienstr. (Germany). Institute of Theoretical Physics); Kettner, Ch.; Glendenning, N.K. Lawrence Berkeley Lab., CA (United States). Jul 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9407143–1: International conference nuclei in the cosmos, Gran Sasso (Italy), 8-13 Jul 1994). Order Number DE95002329. Source: OSTI; NTIS; INIS; GPO Dep.

This paper deals with an investigation of the properties of hypothetical strange-matter stars, which are composed of u, d, s quark matter whose energy per baryon number lies below the one of ^{56}Fe (Witten's strange matter hypothesis). Observable quantities which allow to distinguish such objects from their "conventional" counterparts, neutron stars and white dwarfs, are pointed out.

2026 (SAND–94-1498) **CTH analyses of steel rod penetration into aluminum and concrete targets with comparisons to experimental data.** Kmetyk, L.N.; Yarrington, P. Sandia National Labs., Albuquerque, NM (United States). Oct 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001416. Source: OSTI; NTIS; GPO Dep.

Calculational results are presented here for a class of intermediate-velocity penetration problems. The problems of interest involve penetration of moderate-strength target materials by high-strength projectiles. Two series of metal penetration experiments and a series of concrete slab perforation tests were simulated in this study. The computer code used for the calculations was the CTH code, which employs a recently-developed "boundary layer" algorithm for treating penetration problems such as these.

2027 (UM-P–93/70) **Monte Carlo simulations with indefinite and complex-valued measures.** Kieu, T.D.; Griffin, C.J. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 9p. Sponsored by Australian Research Council, Canberra, ACT (Australia). Order Number DE95607056. Source: OSTI; NTIS (US Sales Only); INIS.

A method is presented to tackle the sign problem in the simulations of systems having indefinite or complex-valued measures. In general, this new approach is shown to yield statistical errors smaller than the crude Monte Carlo using absolute values of the original measures. Exactly solvable, one-dimensional Ising models with complex temperature and complex activity illustrate the considerable improvements and the workability of the new method even when the crude one fails. 7 refs., 3 tabs., 2 figs.

6620 Physics of Elementary Particles and Fields

Refer also to citation(s) 2013

2028 (DOE/ER/40546–T6) **Theoretical particle physics: Progress report, FY 1994.** California Univ., San Diego, CA (United States). 1 Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-90ER40546. (UCSD–955220). Order Number DE95002447. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the following topics: Large-N Expansion; Semileptonic B Decays; Renormalons; Heavy Quark Chiral Perturbation Theory; Kaon and Pion Condensation; Two-Dimensional Models; Higgs Physics; Fermion Number Production; Defects and Phase Transitions; Discrete Flavor Symmetries; Symmetry Breaking; Rare Decays; Baryon Number Generation; Chiral Gauge Theories; Strongly Interacting Higgs Sectors; Higgs Mass Bound; R^2 Gravity.

2029 (DOE/ER/40697–3) **[Experiments at high energy hadron colliders and underground water Cerenkov detector experiment]: Progress report.** State Univ. of New York, Albany, NY (United States). Research Foundation. [1993]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER40697. Order Number DE95001804. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses experiments ran on the DO detector; the Super-Kamiokande underground water Cherenkov detector; and post-SSC development.

6621 General Theory of Particles and Fields

Refer also to citation(s) 1987, 2086, 2198, 2385, 2398

2030 (ANL-HEP-TR–94-57) **Unbinned maximum likelihood fit for the CP conserving couplings for W + photon production at CDF.** Lannon, K. (St. Norbert College, De Pere, WI (United States)). Argonne National Lab., IL (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001471. Source: OSTI; NTIS; INIS; GPO Dep.

We present an unbinned maximum likelihood fit as an alternative to the currently used fit for the CP conserving couplings W plus photon production studied at CDF. We show that a four parameter double exponential fits the E_T spectrum of the photon very well. We also show that the fit parameters can be related to and by a second order polynomial. Finally, we discuss various conclusions we have reasoned from our results to the fit so far.

2031 (CEA-DAPNIA-SPP–93-22) **Measurement of the angle gamma.** Aleksan, R. (CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee); Kayser, B.; Sphicas, P. CEA Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France). Dept. d'Astrophysique, de la Physique des Particules, de la Physique Nucleaire et de l'Instrumentation Associee. Dec 1993. 12p. (CONF-9306258–: Workshop on B physics at hadron accelerators, Snowmass, CO (United States), 21 Jun - 2 jul 1993). Order Number DE95607110. Source: OSTI; NTIS (US Sales Only); INIS.

The angle γ as defined in the Wolfenstein approximation is not completely out of reach of current or proposed dedicated B experiments. This work represents but a first step in the direction of extracting the third angle of the unitarity triangle by study the feasibility of using new decay modes in a hadronic machine. (A.B.). 11 refs., 1 fig., 7 tabs.

2032 (DESY–94-116) **Localized endomorphisms of the chiral Ising model.** Boeckenhauer, J. (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1994. 40p. (HEP-TH–9407079). Order Number DE95715135. Source: OSTI; NTIS (US Sales Only); INIS.

In the frame of the treatment of the chiral Ising model by Mack and Schomerus, examples of localized endomorphisms ρ_1^{loc} and $\rho_{1/2}^{loc}$ are presented. It is shown that they lead to the same superselection sectors as the global ones in the sense that $\pi_0 o \rho_1^{log} \simeq \pi_1$ and $\pi_0 p \rho_{1/2}^{loc} \simeq \pi_{1/2}$ holds. For proving the latter unitary equivalence, Arakis formalism of the selfdual CAR algebra is used.

Further it is shown that the localized endomorphisms obey the Ising fusion rules. (orig.)

2033 (DOE/ER/40200–323) **The generalized Erlangen program and setting a geometry for four- dimensional conformal fields.** Ne'eman, Y. (Tel Aviv Univ. (Israel). Sackler Faculty of Exact Sciences); Hehl, F.W.; Mielke, E.W. Texas Univ., Austin, TX (United States). 22 Oct 1993. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-85ER40200. Order Number DE94013524. Source: OSTI; NTIS; INIS; GPO Dep.

This is the text of a talk at the International Symposium on "Mathematical Physics towards the XXI Century" held in March 1993 at Beersheva, Israel. In the first part we attempt to summarize XXth Century Physics, in the light of Kelvin's 1900 speech "Dark Clouds over XIXth Century Physics." Contrary to what is usually said, Kelvin predicted that the "clouds" (relativity and quantum mechanics) would revolutionize physics and that one hundred years might be needed to harmonize them with classical physics. Quantum Gravity can be considered as a leftover from Kelvin's program – so are the problems with the interpretation of quantum mechanics. At the end of the XXth Century, the Standard Model is the new panoramic synthesis, drawn in gauge-geometric lines – realizing the Erlangen program beyond F. Klein's expectations. The hierarchy problem and the smallness of the cosmological constant are our "clouds", generations and the Higgs sector are to us what radioactivity was in 1900. In the second part we describe Metric-Affine spacetimes. We construct the Noether machinery and provide expressions for the conserved energy and hypermomentum. Superimposing conformal invariance over the affine structure induces the Virasoro-like infinite constraining algebra of diffeomorphisms, applied with constant parameters and opening the possibility of a 4DCFT, similar to 2DCFT.

2034 (DOE/ER/40561–142) **Universal features of multiplicity distributions.** Balantekin, A.B. (Wisconsin Univ., Madison, WI (United States). Dept. of Physics). Washington Univ., Seattle, WA (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG06-90ER40561. Grant PHY-9314131; INT-9001308. Order Number DE94012854. Source: OSTI; NTIS; INIS; GPO Dep.

Universal features of multiplicity distributions are studied and combinants, certain linear combinations of ratios of probabilities, are introduced. It is argued that they can be a useful tool in analyzing multiplicity distributions of hadrons emitted in high energy collisions and large scale structure of galaxy distributions.

2035 (IC–94/84) **The geodesic motion in Kaluza-Klein spinning space.** Baleanu, D. International Centre for Theoretical Physics, Trieste (Italy). Apr 1994. 13p. Order Number DE95607070. Source: OSTI; NTIS (US Sales Only); INIS.

The geodesic motion of pseudo-classical spinning particles in the space of a Kaluza-Klein monopole in the presence of a scalar sigma field coupled to the metric tensor is analysed. The generalized equations for spinning space are investigated and the constants of motion are derived in terms of the solutions of these equations. The motion on a cone and on a plane is analysed. (author). 22 refs.

2036 (IC–94/108) **Equivariant Kaehler geometry and localization in the G/G model.** Blau, M.; Thompson, G. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 39p. (ENSLAPP-L–469/94.). Order Number DE95607073. Source: OSTI; NTIS (US Sales Only); INIS.

We analyze in detail the equivariant supersymmetry of the G/G model. In spite of the fact that this supersymmetry does not model the infinitesimal action of the group of gauge transformations, localization can be established by standard arguments. The theory localizes onto reducible connections and a careful evaluation of the fixed point contributions leads to an alternative derivation of the Verlinde formula for the G_k WZW model. We show that the supersymmetry of the G/G model can be regarded as an infinite dimensional realization of Bismut's theory of equivariant Bott-Chern currents on Kaehler manifolds, thus providing a convenient cohomological setting for understanding the Verlinde formula. We also show that the supersymmetry is related to a non-linear generalization (q-deformation) of the ordinary moment map of symplectic geometry in which a representation of the Lie algebra of a group G is replaced by a representation of its group algebra with commutator [g,h]=gh-hg. In the large k limit it reduces to the ordinary moment gap of two-dimensional gauge theories. (author). 19 refs.

2037 (IC–94/116) **Tachyon condensates and anisotropic universe.** Mahapatra, S.; Mukherji, S. International Centre for Theoretical Physics, Trieste (Italy). Aug 1994. 15p. (IMSC–94-31; HEPTH–9408063.). Order Number DE95607074. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the cosmological solutions in closed bosonic string theory in the presence of non zero tachyon condensate. We specifically obtain time dependent solutions which describe an anisotropic universe. We also discuss the nature of such time dependent solutions when small tachyon fluctuations around the condensate are taken into account. (author). 15 refs.

2038 (IC–94/130) **On D=2 (1/3, 1/3) supersymmetric theories 1.** Saidi, E.H. (Faculte des Sciences, Rabat (Morocco). Section de Physique des Hautes Energies); Zerouaoui, J.; Sedra, M.B. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 20p. Order Number DE95607075. Source: OSTI; NTIS (US Sales Only); INIS.

Denoting by D=2 (1/k,1/k) superalgebra the two dimensional generalized supersymmetry generated by spin s=1/k and -1/k; k=2,3,4, ... charge operators Q and Q-bar satisfying among other things Q^k=P and Q-bar^k=P-bar where P and P-bar are the light components of the energy momentum operator, we build a superspace representation of this exotic symmetry. This realization generalizing the usual D=2 (1/2,1/2) supersymmetric one is based on the use of parafermionic variables θ and θ-bar of spin s=-1/k and 1/k obeying θ^k=θ-bar^k=0 as well as generalized commutation relation rules. Two-dimensional (1/3,0) and (1/3,1/3) invariant scalar superfield models extending the well-known D=2 (1/2,0) and (1/2,1/2) supersymmetric models are given. The link between this exotic symmetry and the periodic representation of $U_q(sl_2)$ with q^k=I is worked out. Other features are also discussed. (author). 15 refs.

2039 (IC–94/131) **On D=2 (1/3,1/3) supersymmetric theories 2.** Saidi, E.H. (Faculte des Sciences, Rabat (Morocco). Section de Physique des Hautes Energies); Zerouaoui, J.; Sedra, M.B. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 18p. Order Number DE95607076. Source: OSTI; NTIS (US Sales Only); INIS.

Denoting by D=2 (1/3,1/3) superalgebra; the off critical symmetry of the $\Phi_{5/7,5/7}$ perturbation of the C=6/7 conformal theory, we build a new superspace solution of the $(1/3,1/3)^-$ subalgebra generated by spin $\pm$1/3 charge operators extending the usual (1/2,1/2) supersymmetry generated by spin $\pm$1/2 charges. This solution is based on the use of two Grassmann variables instead of one parafermionic variable $\theta_{\pm 1/3}$ satisfying the cubic nilpotency condition $(\theta_{\pm 1/3})^3$=0. Known results on the C=6/7 tricritical Potts model are recovered as special features. A relation with N=2 Landau-Ginzburg models is also discussed. (author). 17 refs, 1 tab.

2040 (IC–94/132) **HyperKaehler metrics building and integrable models.** Saidi, E.H. (Faculte des Sciences, Rabat (Morocco). Section Physique des Hautes Energies); Sedra, M.B. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 11p. Order Number DE95607077. Source: OSTI; NTIS (US Sales Only); INIS.

Methods developed for the analysis of integrable systems are used to study the problem of hyperKaehler metrics building as formulated in D=2 N=4 supersymmetric harmonic superspace. We show, in particular, that the constraint equation $\beta\delta^{++2}\omega$-ξ^{++2} exp2$\beta\omega$=0 and its Toda like generalizations are integrable. Explicit solutions together with the conserved currents generating the symmetry responsible of the integrability of these equations are given. Other features are also discussed. (author). 11 refs.

2041 (IC–94/144) **Involutive co-distributions preserved by transitive families of vector fields.** Ayala Bravo, V. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 16p. Order Number DE95607078. Source: OSTI; NTIS (US Sales Only); INIS.

This paper leads with integrability conditions of involutive co-distributions defined on co-tangent bundle of a differentiable manifold M. Via Frobenius's integrability theorem, the analysis is aimed at the search for conditions so that this type of co-distributions preserved by transitive families of vector fields in M. We rely on the work of Lobry, Sussmann, Matsuda and Stefan. The type of situation studies comes up naturally in weak-observability problems and weakly-minimal realizations of arbitrary control systems. (author). 10 refs.

2042 (IC–94/146) **Geometric gauge fields in semiclassical gravity.** Datta, D.P. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 14p. Order Number DE95607079. Source: OSTI; NTIS (US Sales Only); INIS.

Some non-trivial applications of the geometric gauge fields in semiclassical gravity are studied in the framework of the Starobinsky model coupled to quantized matter fields. (author). 17 refs.

2043 (IC–94/147) **Boundary dynamics in dilaton gravity.** Das, S.R. (Tata Inst. of Fundamental Research, Bombay (India)); Mukherji, S. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 18p. (TIFR/TH–94-24; HEP-TH–9407015.). Order Number DE95607080. Source: OSTI; NTIS (US Sales Only); INIS.

We study the dynamics of the boundary in two dimensional dilaton gravity coupled to N massless scalars. We rederive the boundary conditions of [1] and [3] in a way which makes the requirement of reparametrization invariance and the role of conformal anomaly explicit. We then study the semiclassical behaviour of the boundary in the N=24 theory in the presence of an incoming matter wave with a constant energy flux spread over a finite interval. There is a critical value of the matter energy density below which the boundary is stable and all the matter is reflected back. For energy densities greater than this critical value there is a similar behaviour for small values of the total energy thrown in. However, when the total energy exceeds another critical value the boundary exhibits a runaway behaviour and the spacetime develops in singularities and horizons. (author). 10 refs, 3 figs.

2044 (IC–94/156) **Semiglobal Alice strings.** Dvali, G. (Pisa Univ. (Italy). Dipt. di Fisica); Senjanovic, G. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 8p. (IFUP-TH–39/94.). Order Number DE95607081. Source: OSTI; NTIS (US Sales Only); INIS.

We show that in certain theories with topologically trivial quotient space of spontaneously broken gauge symmetry there can exist topologically stable strings that carry nonabelian gauge flux. These objects result from the "accidental" global degeneracy of the vacuum which makes it topologically nontrivial. In particular, some models contain the semiglobal analog of the Alice strings. (author). 7 refs.

2045 (IC–94/168) **Relevance of induced gauge interactions in decoherence.** Datta, D.P. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 10p. Order Number DE95607082. Source: OSTI; NTIS (US Sales Only); INIS.

Decoherence in quantum cosmology is shown to occur naturally in the presence of induced geometric gauge interactions associated with particle production. A new "gauge" - variant form of the semiclassical Einstein equations is also presented which makes the non-gravitating character of the vacuum polarization energy explicit. (author). 20 refs.

2046 (IC–94/173) **Homogeneous anisotropic cosmological models in the minimum quadratic Poincare gauge theory of gravity.** Minkevich, A.V. (Belarusian State Univ., Minsk (Belarus). Dept. of Physics); Nguyen Van Hoang; Nguyen Hong Chuong. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 17p. Order Number DE95607083. Source: OSTI; NTIS (US Sales Only); INIS.

In the present article we resume some of our results on homogeneous anisotropic models of the Poincare gauge theory of gravity based on the Riemann-Cartan spacetime. Namely, within the framework of the minimum quadratic Poincare gauge theory of gravity the dynamics of homogeneous anisotropic Bianchi types I-IX spinning-fluid cosmological models is studied. A basic equation set for these models is obtained and analyzed. In particular, exact solutions for the Bianchi type-I spinning-fluid and Bianchi type-V perfect-fluid models are found in integral form. (author). 30 refs, 2 tabs.

2047 (IC–94/179) **A superfield generalization of the classical action-at-a-distance theory.** Tugai, V.V. (Scientific Physicotechnological Center, Kharkov (Ukraine)); Zheltukhin, A.A. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 12p. Order Number DE95607084. Source: OSTI; NTIS (US Sales Only); INIS.

A generalization of the Fokker-Schwarzschild-Tetrode-Wheeler-Feynman electromagnetic theory onto the superspace is considered. The classical vector and spinor fields belonging to the Maxwell supermultiplet are built of the world-line coordinates of the charged particles in superspace. (author). 9 refs.

2048 (IC–94/185) **On the field theory of the extended-type electron.** Salesi, G. (Universita Statale di Catania, Catania (Italy). Dipt. di Fisica); Recami, E. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 20p. Order Number DE95607069. Source: OSTI; NTIS (US Sales Only); INIS.

In a recent paper, the classical theory of Barut and Zhanghi (BZ) for the electron spin [which interpreted the Zitterbewegung (zbw) motion as an internal motion along helical paths] and its "quantum" version have been investigated by using the language of Clifford algebras. In so doing, a new non-linear Dirac-like equation (NDE) was derived. We want to readdress the whole subject, and "complete" it, by adopting - for the sake of physical clarity - the ordinary tensorial language, within the frame of a first quantization formalism. In particular, we re-derive here the NDE for the electron field, show it to be associated with a new conserved probability current which allows us to work out a quantum probability interpretation of NDE. Actually, we propose this equation in substitution for the Dirac equation, which is obtained from the former by averaging over a zbw cycle. We then derive a new equation of motion for the 4-velocity field which will allow us to regard the electron as an extended object with a classically intelligible internal structure (thus overcoming some known, long-standing problems). We carefully study the solutions of the NDE; with special attention to those implying (at the classical limit) light-like helical motions, since they appear to be the most adequate solutions for the electron description from a kinematical and physical point of view, and to cope with the electromagnetic properties of the electron. (author). 18 refs.

2049 (IC–94/193) **String-loop corrections to effective action and black-hole instabilities.** Belokurov, V.V. (International Centre for Theoretical Physics, Trieste (Italy)); Iofa, M.Z. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 10p. Order Number DE95607085. Source: OSTI; NTIS (US Sales Only); INIS.

Following the ideas of Ellis, Mavromatos and Nanopoulos, to account for instability of 2D black-hole solution, we discuss possible imaginary string-loop corrections to the coefficient at the Einstein term in string effective action. In closed bosonic string theory, such corrections appear because of the tachyon contribution to the integration measure over the moduli. In superstring theory (in critical as well as in non-critical dimensions), no one-string-loop complex corrections to the Einstein term are generated and the mechanism for generating black-hole instabilities proposed above fails. (author). 21 refs.

2050 (IC–94/201) **Central extension of a new W_{∞}-type algebra.** Stoilov, M.N. (International Centre for Theoretical Physics, Trieste (Italy)); Zaikov, R.P. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 6p. Order Number DE95607086. Source: OSTI; NTIS (US Sales Only); INIS.

The central extension of a new infinite dimensional algebra which has both W_{∞} and affine sl(2, R) as subalgebras is found. The critical dimension of the corresponding string model is D=5. (author). 8 refs.

2051 (IC–94/207) **Two dimensional simplicial paths.** Piso, M.I. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 6p. Order Number DE95607087. Source: OSTI; NTIS (US Sales Only); INIS.

Paths on the R^3 real Euclidean manifold are defined as 2-dimensional simplicial strips which are orbits of the action of a discrete one-parameter group. It is proven that there exists at least one embedding of R^3 in the free Z-module generated by $S^2(x_0)$. The speed is defined as the simplicial derivative of the path. If mass is attached to the simplex, the free Lagrangian is proportional to the width of the path. In the continuum limit, the relativistic form of the Lagrangian is recovered. (author). 7 refs.

2052 (IC–94/216) **On exotic supersymmetries of the $\phi_{1,3}$ deformation of minimal models.** Kadiri, A. (Faculte des Sciences, Rabat (Morocco). Section de Physique des Hautes Energies); Saidi, E.H.; Zerouaoui, S.J.; Sedra, M.B. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 40p. Order Number DE95607088. Source: OSTI; NTIS (US Sales Only); INIS.

Using algebraic and field theoretical methods, we study the fractional spin symmetries of the $\phi_{1,3}$ deformation of minimal models. The particular example of the D=2 three state tricritical Potts model is examined in detail. Various models based on subalgebras and appropriate discrete automorphism groups of the two dimensional fractional spin algebra are obtained. General features such as superspace and superfield representations, the $U_q(sl_2)$ symmetry, the spontaneous exotic supersymmetry breaking, relations with the N=2 Landau Ginzburg models as well as other things are discussed. (author). 24 refs.

2053 (IPNO-TH–94-05) **The two-fermion relativistic wave equations of Constraint Theory in the Pauli-Schroedinger form.** Mourad, J. (Paris-11 Univ., 91 - Orsay (France). Lab. de Physique Theorique et Hautes Energies); Sazdjian, H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. 50p. Order Number DE95607089. Source: OSTI; NTIS (US Sales Only); INIS.

The two-fermion relativistic wave equations of Constraint Theory are reduced, after expressing the components of the 4x4 matrix wave function in terms of one of the 2x2 components, to a single equation of the Pauli-Schroedinger type, valid for all sectors of quantum numbers. The potentials that are present belong to the general classes of scalar, pseudoscalar and vector interactions and are calculable in perturbation theory from Feynman diagrams. In the limit when one of the masses becomes infinite, the equation reduces to the two-component form of the one-particle Dirac equation with external static potentials. The Hamiltonian, to order $1/c^2$, reproduces most of the known theoretical results obtained by other methods. The gauge invariance of the wave equation is checked, to that order, in the case of QED. The role of the c.m. energy dependence of the relativistic interquark confining potential is emphasized and the structure of the Hamiltonian, to order $1/c^2$, corresponding to confining scalar potentials, is displayed. (authors). 32 refs., 2 figs.

2054 (ITP–93-64) **On validity of perturbative quantization of the breathing mode in the Skyrme model.** Kostyuk, A.; Kobushkin, A.; Chepilko, N.; Okazaki, T. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 8p. Order Number DE95607090. Source: OSTI; NTIS (US Sales Only); INIS.

We present a detailed discussion of the breathing mode quantization in the Skyrme model and demonstrate that the chiral angle of the hedgehog soliton is strongly affected by the breathing motion.

2055 (JAERI-M–94-028, pp. 45-48) **Relativistic mean field theory for unstable nuclei and its applications.** Sumiyoshi, Kohsuke (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)). Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (In Japanese). (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

Short communication. MEAN-FIELD THEORY/relativistic range; HEAVY ION REACTIONS; NUCLEI; NUCLEAR STRUCTURE; NUCLEAR MODELS

2056 (JINR-E–2-94-132) **On a new type of long-range forces.** Barashenkov, V.S. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Pestov, A.B.; Yur'ev, M.Z. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 6p. Order Number DE95605286. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. A.

It is shown that systems with non fixed (precessing) spin can generate long-range forces, though particle components constituting the system do not possess this property. The equations of motion describing the connection of a new field with its sources are derived. 9 refs. (author).

2057 (JINR-E–2-94-170) **On fractal structure of quantum gravity and relic radiation anisotropy.** Altajskij, M.V.; Bednyakov, V.A.; Kovalenko, S.G. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 10p. Order Number DE95605306. Source: OSTI; NTIS (US Sales Only); INIS.

It is argued that cosmic microwave background large scale ($> 7^0$) anisotropy detected in COBE cosmic experiment can be considered as a trace of the quantum gravity fractal structure. 17 refs.; 1 fig. (author).

2058 (JINR-E–5-94-172) **Quantization of a Hamiltonian system with an infinite number of degrees of freedom.** Zhidkov, P.E. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 14p. Order Number DE95605279. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Letters in Mathematical Physics.

We propose a method of quantization of a discrete Hamiltonian system with an infinite number of degrees of freedom. Our approach is analogous to the usual finite-dimensional quantum mechanics. We construct an infinite-dimensional Schroedinger equation. We show that it is possible to pass from the finite-dimensional quantum mechanics to our construction in the limit when the number of particles tends to infinity. In the paper rigorous mathematical methods are used. 9 refs. (author).

2059 (JINR-R–4-94-115) **Existence domains and some properties of a particle bound state in fields with homogeneous dependence of its potential energy on coordinates.** Matora, I.M. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics. 1994. 10p. (In Russian). Order Number DE95605280. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Optica i Spektroskopiya.

The nonrelativistic bound state problem for a particle embedded in the field, being a homogeneous function of the spatial coordinates, is investigated. On the basis of the Virial theorem general properties of the total energy eigenvalue spectra and the corresponding expectation values of the kinetic and potential energy operators are derived. The analytical solution of the nonrelativistic Schroedinger equation is obtained and the wave functions of bound states for the known problem 'fall on centre' are determined. 8 refs.; 3 figs. (author).

2060 (LAPP–440-93) **Currents on Grassmann algebras.** Coquereaux, R.; Ragoucy, E. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Sep 1993. 20p. (CPT–93/P-2935.). Order Number DE95607115. Source: OSTI; NTIS (US Sales Only); INIS.

Currents are defined on a Grassmann algebra Gr(N) with N generators as distributions on its exterior algebra (using the symmetric wedge product). The currents are interpreted in terms of Z_2-graded Hochschild cohomology and closed currents in terms of cyclic cocycles (they are particular multilinear forms on Gr(N)). An explicit construction of the vector space of closed currents of degree p on Gr(N) is given by using Berezin integration. (authors). 10 refs.

2061 (LAPP-A–424-93) **On black holes, space-time foam and the nature of time in string theory.** Mavromatos, N.E. (European Organization for Nuclear Research, Geneva (Switzerland)). Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Apr 1993. 18p. (CERN-TH–6854/93.). Order Number DE95607091. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that the light particles in string theory obey an effective quantum mechanics modified by the inclusion of a quantum-gravitational friction term, induced by unavoidable couplings to unobserved massive string states in the space-time foam. This term is related to the W-symmetries that couple light particles

to massive solitonic string states in black hole backgrounds, and has a formal similarity to simple models of environmental quantum friction. All properties follow from a definition of target-time as a Renormalization Group scale parameter and the associated (generic) properties of the renormalization group flow. Some experimental consequences, concerning CPT violation detectable in systems that are generally considered as sensitive probes of quantum mechanics (e.g. neutral kaons), are briefly discussed. (author). 52 refs., 1 fig.

2062 (LAPP-A–427-93) **A string derivation of the $ matrix.** Ellis, J. (European Organization for Nuclear Research, Geneva (Switzerland)); Nanopoulos, D.V.; Mavromatos, N.E. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. May 1993. [62p.] (CERN-TH–6897/93; CTP-TAMU–30/93; ACT–10/93.). Order Number DE95607120. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that, in string theory, as a result of the W_∞-symmetries that preserve quantum coherence in the full string theory by coupling different mass levels, transitions between initial- and final-state density matrices for the effective light-particle theory involve non-Hamiltonian terms in their time evolution, and are described by a $ matrix that is not factorizable as a product of field-theoretical S and $S^\dagger$ matrices. Non-trivial string contributions are exhibited to the Hamiltonian and the matrix associated with topological fluctuations related to the coset model that describes a s-wave black hole. The resulting Liouville mode is interpreted as the time variable, and the arrow of time is associated with black hole decay. (K.A.). 60 refs., 8 figs.

2063 (LAPP-A–459/94) **Quantum Hamiltonian reduction in superspace formalism.** Madsen, J.O.; Ragoucy, E. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Feb 1994. 14p. Order Number DE95607113. Source: OSTI; NTIS (US Sales Only); INIS.

Recently the quantum Hamiltonian reduction was done in the case of general sl(2) embeddings into Lie algebras and superalgebras. The results are extended to the quantum Hamiltonian reduction of N=1 affine Lie superalgebras in the superspace formalism. It is shown that if we choose a gauge for the supersymmetry, and consider only certain equivalence classes of fields, then our quantum Hamiltonian reduction reduces to quantum Hamiltonian reduction of non-supersymmetric Lie superalgebras. The super energy-momentum tensor is constructed explicitly as well as all generators of spin 1 (and 1/2); thus all generators in the superconformal, quasi-superconformal and $Z_2{}^*Z_2$ superconformal algebras are constructed. (authors). 21 refs.

2064 (LAPP-L–448/93) **Generalized NLS hierarchies from rational W algebras.** Toppan, F. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Nov 1993. 12p. Order Number DE95607114. Source: OSTI; NTIS (US Sales Only); INIS.

Finite rational W algebras are very natural structures appearing in coset constructions when a Kac-Moody subalgebra is factored out. The problem of relating these algebras to integrable hierarchies of equations is studied by showing how to associate to a rational W algebra its corresponding hierarchy. Two examples are worked out, the sl(2)/U(1) coset, leading to the Non-Linear Schroedinger hierarchy, and the U(1) coset of the Polyakov-Bershadsky W algebra, leading to a 3-field representation of the KP hierarchy already encountered in the literature. In such examples a rational algebra appears as algebra of constraints when reducing a KP hierarchy to a finite field representation. This fact arises the natural question whether rational algebras are always associated to such reductions and whether a classification of rational algebras can lead to a classification of the integrable hierarchies. (author). 19 refs.

2065 (LYCEN–9419) **Supersymmetry and Mathematics.** Gieres, F. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. May 1994. 45p. (In French). Order Number DE95607092. Source: OSTI; NTIS (US Sales Only); INIS.

We present an introduction to the concepts of supersymmetry by discussing three illustrative cases: (i)supersymmetric quantum mechanics, (ii)Lie superalgebras, and (iii)Quillen's super-connections. The common aspects of these notions are pointed out and applications are indicated. Particularly, the prove of Gauss and Bonnet theorem given by Patodi and the prove of Morse inequalities given by Witten are sketched. (author). 85 refs., 2 figs.

2066 (UM-P–93/01) **Ten dimensional SO(10) G.U.T. models with dynamical symmetry breaking.** Hanlon, B.E.; Joshi, G.C. Melbourne Univ., Parkville, VIC (Australia). School of Physics. 1993. 25p. Sponsored by Australian Research Council, Canberra, ACT (Australia). (OZ–93/01.). Order Number DE95607093. Source: OSTI; NTIS (US Sales Only); INIS.

To date, considerations on SO (10) models within Coset Space Dimensional Reduction (CSDR) have been diagonalized to the standard model or rely upon imaginative applications of Wilson lines so as to avoid the problem of the nonexistence of an intermediate Higgs mechanism. However, there is an alternative approach involving four fermion condensates, breaking symmetries by a dynamical mechanism. Indeed, dynamical symmetry breaking has been the direction taken in some SU(5) models within this framework in order to avoid the problems of electroweak symmetry breaking at the compactification scale. This paper presents realistic models which utilize this mechanism. It is shown that the appropriate fermionic representations can emerge from CSDR and the construction of such condensates within the constraints of this scheme is presented. By introducing discrete symmetries onto the internal manifold a strong breaking of the SO(10) G.U.T. is produced and, more importantly, eliminate Higgs fields of geometrical origin. 31 refs.

2067 (UM-P–93/33) **A covariant canonical description of Liouville field theory.** Papadopoulos, G. (King's Coll., London (United Kingdom). Dept. of Mathematics); Spence, B. Melbourne Univ., Parkville, VIC (Australia). School of Physics. Mar 1993. 12p. Sponsored by Commission of the European Communities, Brussels (Belgium). Order Number DE95607094. Source: OSTI; NTIS (US Sales Only); INIS.

This paper presents a new parametrisation of the space of solutions of Liouville field theory on a cylinder. In this parametrisation, the solutions are well-defined and manifestly real functions over all space-time and all of parameter space. It is shown that the resulting covariant phase space of the Liouville theory is diffeomorphic to the Hamiltonian one, and to the space of initial data of the theory. The Poisson brackets are derived and shown to be those of the cotangent bundle of the loop group of the real line. Using Hamiltonian reduction, it is shown that this covariant phase space formulation of Liouville theory may also be obtained from the covariant phase space formulation of the Wess-Zumino-Witten model. 19 refs.

2068 (UM-P–93/38) **The space of solutions of Toda field theory.** Papadopoulos, G. (King's Coll., London (United Kingdom). Dept. of Mathematics); Spence, B. Melbourne Univ., Parkville, VIC (Australia). School of Physics. May 1993. 14p. Sponsored by Commission of the European Communities, Brussels (Belgium). (KCL–93/7; HEP-TH–9306088.). Order Number DE95607095. Source: OSTI; NTIS (US Sales Only); INIS.

A new parameterization of the solutions of Toda field theory is introduced. In this parameterization, the solutions of the field equations are real, well-defined functions on space-time, which is taken to be two-dimensional Minkowski space or a cylinder. The global structure of the covariant phase space of Toda theory is examined and it is shown that it is isomorphic to the Hamiltonian phase space. The Poisson brackets of Toda theory are then calculated. Finally, using the methods developed to study the Toda theory, these results are extended to the non-Abelian Toda field theories. 23 refs.

2069 (UM-P–93/44) **Statistical mechanics of the magnetized pair Bose gas.** Daicic, J.; Frankel, N.E.; Gailis, R.M.; Kowalenko, V. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 63p. Order Number DE95607096. Source: OSTI; NTIS (US Sales Only); INIS.

The statistical mechanics of the charged relativistic Bose gas with pair creation in d spatial dimensions is studied. It begins with the case of a gas with no external fields present, and investigate the nature of the phase transition at the critical temperature for Bose-Einstein condensation, and also the behaviour of the specific heat in the ultra-relativistic (photon) limit. An extensive study of the

pair Bose gas in an external homogeneous magnetic field is then presented, employing a Mellin transform technique to obtain high-temperature expansions for the thermodynamic potential and magnetization of this system for a wide range of field strengths. It is shown that Bose-Einstein condensation does occur in the relativistic regime for $d \geq 5$, and that for $d \geq 3$ the magnetization has a remarkably different form to that of the non-relativistic gas, but that the Meissner effect is still exhibited. The pair Bose gas is therefore shown to be a relativistic superconductor. 40 refs.

2070 (UM-P–93/45) **Statistical mechanics of magnetized pair Fermi gas.** Daicic, J.; Frankel, N.E.; Kowalenko, V. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 28p. Order Number DE95607097. Source: OSTI; NTIS (US Sales Only); INIS.

Following previous work on the magnetized pair Bose gas this contribution presents the statistical mechanics of the charged relativistic Fermi gas with pair creation in d spatial dimensions. Initially, the gas in no external fields is studied. As a result, expansions for the various thermodynamic functions are obtained in both the $\mu/m \to 0$ (neutrino) limit, and about the point $\mu/m = 1$, where μ is the chemical potential. The thermodynamics of a gas of quantum-number conserving massless fermions is also discussed. Then a complete study of the pair Fermi gas in a homogeneous magnetic field, is presented investigating the behavior of the magnetization over a wide range of field strengths. The inclusion of pairs leads to new results for the net magnetization due to the paramagnetic moment of the spins and the diamagnetic Landau orbits. 20 refs.

2071 (UM-P–93/63) **Matrix element and complex l-plane evaluation of two-loop vacuum amplitudes in QED on S4.** Harris, B.A.; Joshi, G.C. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 50p. Order Number DE95607099. Source: OSTI; NTIS (US Sales Only); INIS.

This paper further develops the matrix element and complex angular momentum summation techniques, of the authors, in order to calculate both the one-loop free field, and two-loop interacting vacuum diagrams in field theory on a four-sphere. In the case of the free field diagrams, it is shown how the sums may be evaluated by integrating over an analytic function with both poles and branch cuts where the discontinuity across the cuts determines the result. Then, the matrix element formalism is extended to multiple angular momenta involving the addition of angular momenta and the associated Clebsch-Gordon type selection rules. This then allows to evaluate the matrix elements of two-loop diagrams in spherical QED as a function of the three angular momenta in the diagram. The selection rules allows to cast the triple angular momentum sum into a form which enables evaluation again by contour integrated. The result is obtained in analytic form using dimensional regularization for the previously obtained spinor case, and also for scalar QED which is believed to be a new result. Finally, the applicability of this method for calculations in non-Abelian field theory is discussed. 13 refs., 4 figs.

2072 (UM-P–93/65) **Statistical mechanics of relativistic spin-1 bosons in a magnetic field.** Daicic, J.; Frankel, N.E. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 18p. Order Number DE95607100. Source: OSTI; NTIS (US Sales Only); INIS.

This paper investigates the statistical mechanics of a gas of spin-1 particles with pair creation in a homogeneous magnetic field. It is shown that expansions for the thermodynamic potential and magnetization in fields below the mass scale of the constituent particles are well behaved. However, when the field is at or above the mass scale, an intrinsic pathology of the single-particle energy spectrum manifests itself in the statistical mechanics of the system. Whilst for the spin-0 and spin-1/2 analog of this system there seemed to be no barrier ab initio to the field strength, the nature of the vacuum, and the role of interactions, were always borne in mind as matters to be considered in a high-order treatment, particularly when the field was at or above the mass scale. In the spin-1 case, the pathology in the single-particle energy spectrum heralds this from the beginning, and seems to be a warning that a single particle non-interacting picture of physics at high energies needs some reconsideration. 10 refs.

2073 (UM-P–93/71) **The Hamiltonian of SU(2) lattice gauge theory in approximate tri-diagonal form.** Hollenberg, L.C.L. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 16p. (OZ–93/15.). Order Number DE95607101. Source: OSTI; NTIS (US Sales Only); INIS.

Employing Hamiltonian moments of SU(2) lattice gauge theory, with respect to the strong coupling vacuum, the matrix elements of the Lanczos tri-diagonal form are written down from the plaquette expansion to order $1/N^2_p$ in the number of plaquettes, N_p. The consequences of this approximate tri-diagonal form are studied by computing the vacuum energy density and the specific heat in the infinite lattice limit, for strong to weak coupling. The results at this order appear to reach beyond the strong to weak transition point at $g^{1/2}_c \approx 2.0$, as indicated by the peaking behaviour of the specific heat. The results demonstrate that the plaquette expansion method to the order considered here is able to describe the physics of the vacuum at the strong to weak transition and just beyond. Whilst the accuracy of the results presented here are not quite of the caliber of the t-expansion or Monte-Carlo calculations, the method used here is simpler and, since it is semi-analytic and not dependent on extrapolation, is to a large extent cleaner. In principle, the results can be improved by increasing the plaquette expansion order and/or choosing a better trial state. Furthermore, unlike a variational approach, this framework allows for the calculation of excited states and so physically interesting quantities such as glueball masses and the string tension, could be calculated by diagonalizing the plaquette expansion in the relevant sector. 17 refs., 3 figs.

2074 (UM-P–93/72) **Staggered magnetization in the Heisenberg antiferromagnet.** Hollenberg, L.C.L.; Tomlinson, M.J. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 13p. Sponsored by Australian Research Council, Canberra, ACT (Australia). Order Number DE95607102. Source: OSTI; NTIS (US Sales Only); INIS.

In the presence of a staggered magnetic field the plaquette expansion of the Lanczos matrix elements are obtained for the antiferromagnetic 2D Heisenberg model up to order $1/N_p$ (N_p is the number of plaquettes on the lattice). The resulting approximate tri-diagonal form of the Hamiltonian is diagonalized for various values of the field strength in the $N_p \to \infty$ limit for the ground state energy density. From the behaviour of the ground state energy density at weak fields the staggered magnetization at this order in the plaquette expansion is found to be 0.647 (in units where the Neel state staggered magnetization is 1.0). The estimated error is only a few percent. 8 refs., 4 figs.

6622 Specific Theories and Interaction Models; Particle Systematics

Refer also to citation(s) 2031, 2061, 2071, 2151, 2177, 2192, 2208, 2233, 2236, 2269, 2270, 2272

2075 (DESY–93-123C, pp. 177-185) **Parameterizations of the W anomalous self-couplings.** Boudjema, F. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The aim of this note is to compare the different parameterizations of the anomalous WWV couplings. There are now two phenomenological parameterizations on the market and some confusion between the defining parameters has, unfortunately, arisen, especially as concerns the parameter K_Z. The two parameterizations as well as the conversion between the two is given below. A hierarchy of couplings based of a set of fully gauge invariant operators is also discussed. (orig.)

2076 (DESY–93-123C, pp. 303-308) **Comment on the average momentum of top quarks in the threshold region.** Jezabek, M. (Inst. of Nuclear Physics, Cracow (Poland)); Kuehn, J.H.; Teubner, T. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20

Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The behavior of the momentum distribution of top quarks in the threshold region is investigated. The qualitative behavior, in particular the dependence of the average momentum on the strong coupling constant can be understood from analytical calculations for the Coulomb potential. Ambiguities in the relation between the excitation curve and the top mass are addressed. (orig.)

2077 (DESY–94-109) **Massless particles, electromagnetism, and Rieffel induction.** Landsman, N.P. (ed.) (Hamburg Univ. (Germany). 2. Inst. fuer Theoretische Physik); Wiedemann, U.A. (ed.). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jun 1994. 50p. Order Number DE95715133. Source: OSTI; NTIS (US Sales Only); INIS.

The connection between space-time covariant representations (obtained by inducing from the Lorentz group) and irreducible unitary representations (induced from Wigner's little group) of the Poincare groups is re-examined in the massless case. In the situation relevant to physics, it is found that these are related by Marsden-Weinstein reduction with respect to a gauge group. An analogous phenomenon is observed for classical massless relativistic particles. This symplectic reduction procedure can be ('second') quantized using a generalization of the Rieffel induction technique in operator algebra theory, which is carried through in detail for electromagnetism. Starting from the so-called Fermi representation of the field algebra generated by the free abelian gauge field, we construct a new ('rigged') sesquilinear form on the representation space, which is positive semi-definite, and given in terms of a Gaussian weak distribution (promeasure) on the gauge group (taken to be a Hilbert Lie group). This eventually constructs the algebra of observables of quantum electromagnetism (directly in its vacuum representation) as a representation of the so-called algebra of weak observables induced by the trivial representation of the gauge group. (orig.)

2078 (DESY–94-145) **Topological zero modes in Monte Carlo simulations.** Dilger, H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Aug 1994. 13p. (HEP-LAT–9408017). Order Number DE95715038. Source: OSTI; NTIS (US Sales Only); INIS.

We present an improvement of global Metropolis updating steps, the instanton hits, used in a hybrid Monte Carlo simulation of the two-flavor Schwinger model with staggered fermions. These hits are designed to change the topological sector of the gauge field. In order to match these hits to an unquenched simulation with pseudofermions, the approximate zero mode structure of the lattice Dirac operator has to be considered explicitly. (orig.)

2079 (DOE/ER/40344–8) **Strong interactions studies with medium energy probes: Progress report, 1993–1994.** Seth, K.K. Northwestern Univ., Evanston, IL (United States). Sep 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-87ER40344. Order Number DE95001800. Source: OSTI; NTIS; INIS; GPO Dep.

This progress report refers to the period August 1993 to September 1994, which includes the second year of the three year period December 1, 1992–November 30, 1995 of our existing research contract. The budget proposal for the third year, December 1, 1994 to November 30, 1995 as originally approved, is also presented. As anticipated in our 1992–1995 proposal, Fermilab E760/E835 on high precision charmonium spectroscopy has remained a major part of our preoccupation and commitment during the last year, and it will remain so in the forthcoming year. In early 1994 we joined the collaboration of the Brookhaven experiment E852 on the spectroscopy of states with exotic quantum numbers. The first successful three month run of E852 was completed on July 31 and preliminary data analysis has been started. Some new commitments have resulted from this collaboration and a separate proposal for supplemental financial support is being prepared for them. At Los Alamos our experiment #1274 on search of extremely neutron rich exotic nuclei by pion absorption began making initial measurements a month ago and is expected to take data during the period October 15–November 30, 1994. In addition to the above on-going programs, our Bates proposal (94-01) for a definitive measurement of the quenching of the longitudinal response in quasi-free scattering of electrons from nuclei has been approved with high priority for 600 hours of beam time, and we expect to start the experiment in late 1995.

2080 (DOE/ER/40561–130) **Constraints on T-odd and P-even hadronic interactions from nucleon, nuclear, and atomic electric dipole moments.** Haxton, W.C. (Washington Univ., Seattle, WA (United States)); Hoering, A.; Musolf, M.J. Washington Univ., Seattle, WA (United States). [1994]. 33p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE94012845. Source: OSTI; NTIS; INIS; GPO Dep.

We deduce constraints on time-reversal-noninvariant (TRNI), parity-conserving (PC) hadronic interactions from nucleon, nuclear, and atomic electric dipole moment (edm) limits. Such interactions generate edm's through weak radiative corrections. We consider long-ranged mechanisms, i.e., those mediated by meson exchanges in contrast to short-range two-loop mechanisms. We find that the ratio of typical TRNI. PC nuclear matrix elements to those of the strong interaction are $\lesssim 10^{-5}$, a limit about two orders of magnitude more stringent than those from direct detailed balance studies of such interactions.

2081 (DOE/ER/40561–133) **π-η mixing from QCD sum rules.** Chan, C.T.; Henley, E.M.; Meissner, T. Washington Univ., Seattle, WA (United States). Mar 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE94012847. Source: OSTI; NTIS; INIS; GPO Dep.

The q_2 dependence of the π-η mixing amplitude is examined with the use of QCD sum rules. The linear slope of the mixing function $\theta(q^2)$ is found to be much smaller than that for ρ-ω mixing. Thus the mixing amplitude is approximately the same in the space-like region as in the time-like one, and one may neglect the q^2 dependence of the mixing. A comparison between a hadron-meson, an effective chiral model, and the QCD sum rules approaches is made.

2082 (FZR–49(prepr.)) **An effective model of the quark-gluon plasma with thermal parton masses.** Peshier, A. (Technische Univ. Dresden (Germany). Inst. fuer Theoretische Physik); Kaempfer, B.; Pavlenko, O.P.; Soff, G. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Jul 1994. 12p. Order Number DE95715031. Source: OSTI; NTIS (US Sales Only); INIS.

A model is presented which reproduces the pure SU(3) gauge theory on the lattice for thermodynamical quantities. It exploits only thermal quark and gluon masses $m(T) \propto g(T)T$ and no other interaction or bag constant. The latent heat at confinement temperature is much smaller compared with the bag model parametrization; this modifies drastically the cooling velocity of the quark-gluon plasma and the duration of the deconfinement phase. The effective thermal quark masses lead to a kinematical threshold and violate the M_T scaling of the transverse dilepton spectrum from the plasma. (orig.)

2083 (GSI–94-53(prepr.)) **Effective field theories from QCD.** Sollacher, R. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Aug 1994. 7p. (CONF-9407135–: QCD 94: nuclear physics B, Montpellier (France), 7-13 Jul 1994). Order Number DE95711146. Source: OSTI; NTIS (US Sales Only); INIS.

We present a method for extracting effective Lagrangians from QCD. The resulting effective Lagrangians are based on exact rewrites of cut-off QCD in terms of these new collective field degrees of freedom. These cut-off Lagrangians are thus 'effective' in the sense that they explicitly contain some of the physical long-distance degrees of freedom from the outset. As an example we discuss the introduction of a new collective field carrying the quantum numbers of the η'-meson. (orig.)

2084 (IC–94/64) **Heavy quark effective theory, interpolating fields and Bethe-Salpeter amplitudes.** Hussain, F.; Thomspon, G. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 12p. (HEP-PH–9407330.). Order Number DE95607146. Source: OSTI; NTIS (US Sales Only); INIS.

We use the LSZ reduction theorem and interpolating fields, along with the heavy quark effective theory, to investigate the structure of the Bethe-Salpeter amplitude for heavy hadrons. We show how a simple form of this amplitude, used extensively in heavy hadron decay calculations, follows naturally up to O(1/M) from these field theoretic considerations. (author). 13 refs, 1 tab.

2085 (IC–94/119) **Critical parameters of Quark-Hadron phase transition with interacting and massive quarks.** Singh, C.P. (International Centre for Theoretical Physics, Trieste (Italy)); Patra, B.K. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 11p. Order Number DE95607143. Source: OSTI; NTIS (US Sales Only); INIS.

Current techniques to simulate the dynamical behaviour of Quark-Gluon Plasma (QGP) reveal that the order of the phase transition as well as the values of the critical parameters depend on the number of quark flavours as well as on the quark-masses included in the simulation. We attempt to show here the effects of the number of quark flavours and quark-masses on critical parameters by using the perturbative, finite temperature field theory to g^3_s order in the strong coupling g_s. We treat the hadrons as particles with finite size and its implications on the equation of state for hadron gas are studied. We find that the critical temperature T_c is lowered by 9 MeV as we move from two to three quark flavours. The nature of the phase transition always remains as first order. However, the inclusion of quark-masses in our calculation does not affect the result much. (author). 14 refs, 3 figs.

2086 (IC–94/155) **Valencia 93: The summary of particle theory.** Senjanovic, G. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 12p. Order Number DE95607121. Source: OSTI; NTIS (US Sales Only); INIS.

The International School on Cosmological Dark Matter held in Valencia in the fall of 1993 was devoted to the interplay of cosmology and particle physics, with the obvious emphasis on the Dark Matter issue. Here I present the expanded version of my summary talk regarding the particle physics theory part of the School. (author). 13 refs.

2087 (IC–94/169) **The twist-3 single spin asymmetries of pion production.** Efremov, A. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics); Teryaev, O.; Korotkiyan, V. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 7p. Order Number DE95607144. Source: OSTI; NTIS (US Sales Only); INIS.

Single spin parton asymmetries for the high p_T gluon and quark production are calculated. Using the sum rules, relating twist-3 quark-gluon correlators with twist-2 distribution function, we propose an explanation of the difference in the sign of the asymmetries for π^+, π^0 and π^- productions. (author). 6 refs, 2 figs.

2088 (IC–94/191) **Zero sound velocity in π, ρ mesons at different temperatures.** Dey, J. (International Centre for Theoretical Physics, Trieste (Italy)); Dey, M.; Tomio, L.; Araujo, C.F. de Jr. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 12p. Order Number DE95607145. Source: OSTI; NTIS (US Sales Only); INIS.

Sharp transitions are perhaps absent in QCD, so that one looks for physical quantities which may reflect the phase change. One such quantity is the sound velocity which was shown in lattice theory to become zero at the transition point for pure glue. We show that even in a simple bag model the sound velocity goes to zero at temperature $T=T_\nu \neq 0$ and that the numerical value of this T_ν depends on the nature of the meson. The average thermal energy of mesons go linearly with T near T_ν, with much smaller slope for the pion. The T_ν - s can be connected with the Boltzmann temperatures obtained from transverse momentum spectrum of these mesons in heavy ion collision at mid-rapidity. It would be interesting to check the presence of different T_ν - s in present day finite T lattice theory. (author). 22 refs, 1 fig., 2 tabs.

2089 (IC–94/202) **Masses of heavy fermions and Higgs boson in four-generation fermion condensate scheme.** Zhou Bang-rong. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 12p. Order Number DE95607124. Source: OSTI; NTIS (US Sales Only); INIS.

The renormalization group analyses based on low-energy effective Lagrangian indicate that a model of electroweak breaking of Nambu-Jona-Lasinio (NJL) type with four generations of quarks and leptons could accommodate itself to the top-quark mass $\approx$ 174 GeV for the acceptable momentum cut-off and $\approx 10^6$ - 5×10^3 GeV. The fourth generation of quarks will always be heavier than the top-quark but the corresponding leptons, though being heavier than the Z boson, can be either lighter or heavier than the top-quark depending on Λ being either greater or less than $\approx 2.5 \times 10^4$ GeV. The mass of the Higgs boson is predicted to be in the region 287-481 GeV which could provide an important experimental test of the model. (author). 11 refs, 1 tab.

2090 (IPNO-TH–93-25) **The no-hair conjecture in 2D dilaton supergravity.** Gamboa, J.; Georgelin, Y. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jun 1993. 19p. Order Number DE95607125. Source: OSTI; NTIS (US Sales Only); INIS.

Two dimensional dilaton gravity and supergravity are studied following Hamiltonian methods. The structure of constraints of 2D dilaton gravity and the 2D dilaton supergravity theory is discussed taking the square root of the bosonic constraints. The equations of motion are integrated in both cases, and it is shown that the solutions of the equation of motion of 2D dilaton supergravity differs from the solutions of 2D dilaton gravity only by boundary conditions on the fermionic variables, i.e. the black holes of 2D dilaton supergravity theory are exactly the same black holes of 2D bosonic dilaton gravity modulo supersymmetry transformations. This result is the bidimensional analogue of the no-hair theorem for supergravity. (authors). 28 refs.

2091 (IPNO-TH–93-37) **On the spectral density of Euclidean Dirac operator in QCD.** Smilga, A.V. (Bern Univ. (Switzerland). Inst. fuer Theoretische Physik); Stern, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Aug 1993. 14p. (BUTP–93/19.). Order Number DE95607138. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown that, when the number of light flavours is larger than 2, the spectral density of the Euclidean Dirac operator in QCD averaged over gauge field configurations involves at small eigenvalues a nonanalytic piece $\rho(\lambda)\alpha$—λ—. The spectral density in the large N_c limit is also discussed. (authors). 8 refs., 3 figs.

2092 (IPNO-TH–93-41) **Strong Coulomb coupling in relativistic quantum constraint dynamics.** Bawin, M. (Liege Univ. (Belgium). Inst. de Physique); Cugnon, J.; Sazdjian, H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 27 Sep 1993. [22p.] Order Number DE95607132. Source: OSTI; NTIS (US Sales Only); INIS.

The bound state problem of two oppositely charged spin-1/2 particles, with masses m_1 and m_2 is studied in mutual electromagnetic interaction in the framework of Relativistic Quantum Constraint Dynamics. The critical value of the coupling constant α is determined for which the bound state energy reaches the lower continuum, thus indicating the instability of the heavier particle or of the strongly coupled QED vacuum in the equal mass case. Two different choices of the electromagnetic potential are considered, corresponding to different extensions of the substitution rule into the nonperturbative region of α. For the first one, the Todorov potential it is found that for $m_2 > m_1$ there is always a critical value α_c of α, depending on m_2/m_1, for which instability occurs. In the equal mass case, instability is reached at $\alpha_c = 1/2$ with a vanishing value of the cut-off radius, generally needed for this potential at short distances. For the second case, for potential II, it is found that instability occurs only for $m_2 > 2.16\ m_1$. (authors). 12 refs., 4 figs.

2093 (IPNO-TH–93-68) **Ground state properties and glueball spectrum in SU(2) Yang-Mills theory using gauge invariant variables.** Martin, C.; Vautherin, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 18p. Order Number DE95607139. Source: OSTI; NTIS (US Sales Only); INIS.

A nonperturbative calculation of the spectrum of SU(2) Yang-Mills theory based on a Hamiltonian formulation is described. The approach exploits gauge invariant variables similar to those used in nuclear physics to describe collective motion in nuclei. (authors). 13 refs.

2094 (ITF–93-38) **Dynamical chiral symmetry breaking in scale invariant quantum electrodynamics in sixth dimensions.** Gorbar, Eh.V.; Sausedo, Eh. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 13p. (In Russian). Order Number DE95607133. Source: OSTI; NTIS (US Sales Only); INIS.

The scale invariant extension of quantum electrodynamics on six-dimensional space-time is considered. This model extension permits to show that essentially non analytical dependence of the chiral order parameter observing in ladder approximation of quantum electrodynamics and corresponded non triviality of the local limit of the theory are connected with exact scale invariance of theory in ladder approximation.

2095 (JINR-E–2-94-88) **Mass splitting of the pseudoscalar and vector mesons induced by the homogeneous vacuum gluon field.** Burdanov, Ya.V. (Ivanovskij Gosudarstvennyj Univ., Ivanovo (Russian Federation)); Solunin, S.A.; Efimov, G.V.; Nedelko, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 16p. Order Number DE95605322. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Zeitschrift fuer Physik. C, Particles and Fields.

Masses of the pseudoscalar and vector mesons are calculated within the generalized Nambu-Jona-Lasinio model taking into account homogeneous vacuum gluon field. This vacuum provides an analytical quark confinement. Colorless modes are determined by the confined gluons and are described by the nonlocal quark currents with appropriate radial and angular quantum numbers. An interaction of the quark spin with the vacuum gluon field arises naturally within the model under consideration. It is shown that this spin-field interaction leads to mass splitting between vector and pseudoscalar mesons with identical quark structure (ρ - π, K-K* and so on). In contrast to the standard NJL model, this allows to use the four-fermion coupling constant being common for both nonets. 24 refs.; 1 fig.; 2 tabs. (author).

2096 (JINR-E–2-94-89) **Excited states of mesons within the NJL model with the homogeneous vacuum gluon field.** Burdanov, Ya.V. (Ivanovskij Gosudarstvennyj Univ., Ivanovo (Russian Federation)); Solunin, S.A.; Efimov, G.V.; Nedelko, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. Order Number DE95605323. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to International Journal of Modern Physics A.

Excited states of mesons are considered within generalization of the Nambu-Jona$_L$asinio model taking into account the (anti)self-dual homogeneous background gluon field. This vacuum configuration ensures an analytical quark confinement. Colorless models are determined by the confined gluons and are described by the nonlocal quark currents with appropriate radial and orbital quantum numbers. The effective meson Lagrangian corresponds to ultraviolet finite theory. Spectrum of radial and orbital meson excitations predicted by the model is asymptotically equidistant, i.e., it has the Regge behavior. For real values of the orbital momentum it describes experimental data quantitatively. 22 refs.; 1 fig.; 2 tabs. (author).

2097 (JINR-E–2-94-117) **Exact solution of 2 D Poincare gravity coupled with fermion matter.** Solodukhin, S.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 16p. Order Number DE95605314. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

The 2 D model of gravity with dyad e^a and the Lorentz connection one-form ω as independent gravitational variables coupled with rd massless Dirac matter is considered. It is shown that the classical equations of motion are exactly integrated. 12 refs. (author).

2098 (JINR-E–2-94-162) **On a possible explanation of the origin of the quark mass spectrum.** Kazakov, D.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 7p. Order Number DE95605315. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters. B.

Contrary to the usual case when the quark mass spectrum is defined by that of the quark Yukawa couplings while the vacuum expectation value of the Higgs field remains universal, we suggest to consider the opposite situation. Each generation of quarks and leptons is associated with its own Higgs doublet, while the Yukawa couplings are the same. This situation naturally arises in the framework of finite supersymmetric Grand Unification scenario. Non degeneracy of the quark mass spectrum is then due to asymmetric vacuum expectation values which spontaneously break the discrete flavour symmetry in the Higgs sector. 6 refs. (author).

2099 (UM-P–93/54) **A partial unification model in non-commutative geometry.** Hanlon, B.E.; Joshi, G.C. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 23p. (OZ–93/12.). Order Number DE95607129. Source: OSTI; NTIS (US Sales Only); INIS.

The $SU(2)_L$ product $SU(2)_R$ product SU(4) partial unification models is presented as an example of phenomenologically acceptable unification models in the absence of supersymmetry in non-commutative geometry. The authors exploit the Chamseddine, Felder and Froehlich generalization of the Connes and Lott model building prescription. By introducing a bi-module structure and appropriate permutation symmetries a model is constructed with triplet Higgs fields in the SU(2) sectors and spontaneous breaking of SU(4). It was found that a very natural model emerges without the need to introduce singlet spinors or additional set of conjugate fermions. The symmetry breaking scales, corresponding to the 'distance' between copies of space-time, can now find a geometrical basis. 13 refs.

6623 Specific Interactions, Decays and Processes

Refer also to citation(s) 2030, 2074, 2086, 2185, 2186, 2194, 2195, 2237, 2243, 2252

2100 (DESY–93-123C) **e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.** Zerwas, P.M. (ed.). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. 611p. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

These proceedings contain the articles presented at the named workshop. These concern the production of Higgs bosons, electroweak gauge bosons, top particles, particles required by grand unification, supersymmetric particles in 500 Gev e^+e^- interactions together with $\gamma\gamma$ physics and some description of collider detectors. See hints under the relevant topics. (HSI)

2101 (DESY–93-123C, pp. 5-34) **Higgs bosons: Intermediate mass range at e^+e^- colliders.** Barger, V. (Physics Dept., Univ. Wisconsin, Madison, WI (United States)); Cheung, K.; Djouadi, A.; Kniehl, B.A.; Phillips, R.J.N.; Zerwas, P.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We elaborate on the production of the Standard Model Higgs particle at high-energy e^+e^{-c} colliders through the reactions $e^+e^- \rightarrow$ ZH and $e^+e^- \rightarrow$ anti $\nu\nu$H. Particular emphasis is put on the intermediate mass range. In addition to the signal we discuss in detail the background processes. Angular distributions which are sensitive to the spin and parity of the Higgs particle are analyzed. (orig.)

2102 (DESY–93-123C, pp. 35-44) **Production of a Higgs with two gauge bosons.** Baillargeon, M. (Lab. de Physique Theorique, ENSLAPP, 74 - Annecy-le-Vieux (France)); Boudjema, F.; Cuypers, F.; Gabrielli, E.; Mele, B. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We study Higgs boson production in association with a pair of electroweak vector bosons (WW, ZZ, Zγ) in the framework of the standard model. Total cross sections for the intermediate-mass

Higgs are presented with special emphasis on a center-of-mass energy $\sqrt{s} \simeq 500$ GeV where the cross sections turn out to be more favourable than at larger energies. We find that with an integrated luminosity of 10-20 fb^{-1} there is a sizeable event rate for the HWW and HZγ channels, while a larger integrated luminosity is needed to study the HZZ production. We take into account various backgrounds, notably top-pair and triple vector-boson production, and show ways to significantly reduce their effects. (orig.)

2103 (DESY–93-123C, pp. 45-50) **CP violation in Higgs decays due to Majorana neutrinos.** Ilakovac, A. (Mainz Univ. (Germany). Inst. fuer Physik); Kniehl, B.A.; Pilaftsis, A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility of observing CP violation in the decays of Higgs particles into top-quark, W- and Z-boson pairs induced by heavy Majorana neutrinos is discussed. In the context of minimal "see-saw" models with interfamily mixings, we find that Majorana neutrinos may give rise to sizable CP-odd effects at the one-loop electroweak order. We present numerical estimates of typical CP-odd observables that might be triggered at high-energy e^+e^- colliders. (orig.)

2104 (DESY–93-123C, pp. 51-54) **Correlations in Higgs production and decay as a probe of CP-violation in the scalar sector.** Djouadi, A. (Lab. Phys. Nucl., Univ. Montreal, PQ (Canada)); Kniehl, B.A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We present the expressions of the angular correlations in the production reaction $e^+e^- \to Z\Phi$ and the decay processes $\Phi \to V(^*)V(^*) \to 4$ fermions, where the scalar boson, Φ, is a mixture of CP-even and CP-odd states. These correlations can be used to probe CP-violation in the Higgs sector. (orig.)

2105 (DESY–93-123C, pp. 55-67) **Invisibly decaying Higgs boson at e⁺e⁻ collisions.** Eboli, O.J.P. (Inst. de Fisica, Univ. de Sao Paulo (Brazil)); Gonzalez-Garcia, M.C.; Novaes, S.F.; Romao, J.C.; Lopez-Fernandez, A.; Campos, F. de. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

In many extensions of the standard model the Higgs boson can have substantial "invisible" decay modes, for example, into light or massless weakly interacting Goldstone bosons associated to the spontaneous violation of lepton number below the weak scale. In this work, we first review the model independent limits on the Higgs boson from the analysis of the present LEP samples after including the possibility of invisible decays and study the prospects for LEP II. Next, we study the detectability prospects for such invisible Higgs boson at the Next Linear Collider. (orig.)

2106 (DESY–93-123C, pp. 69-78) **Perspectives of neutral supersymmetric Higgs boson searches at a 500 GeV e⁺e⁻ linear collider.** Rosiek, J. (Inst. of Theoretical Physics, Warsaw Univ. (Poland)); Sopczak, A.; Chankowski, P.H.; Pokorski, S. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Perspectives of searches for neutral Higgs bosons at a future e^+e^- collider running at $\sqrt{s}$ = 500 GeV (EE500) are analyzed in the Minimal Supersymmetric Standard Model (MSSM). Full 1-loop diagrammatic calculations of radiative corrections are applied to study prospects for the discovery and identification of Higgs signals as a function of various SUSY parameters. In large parameter regions more than one Higgs boson can be found. However, if only one scalar is discovered, comparison of production rates and decay branching ratios shows that it may be difficult to distinguish the lightest SUSY scalar from the Higgs boson of the Minimal Standard Model (MSM). (orig.)

2107 (DESY–93-123C, pp. 79-86) **Radiative corrections to the supersymmetric Higgs sector.** Hempfling, R. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)); Kniehl, B.A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The Higgs sector of the minimal supersymmetric extension of the standard model (MSSM) becomes phenomenologically hard to distinguish from the standard model (SM) in the limit that the CP-odd scaler, A^0, is much heavier than the Z boson. If, in addition, all the superpartners lie outside the kinematic reach of the Next Linear Collider (NLC), the only experimental evidence for sugersymmetry (SUSY) might be through internal loops involving superpartners. We have calculated sfermion-induced radiative corrections to $e^+e^- \to Zh^0$ in the MSSM, which are enhanced for high m_t. (orig.)

2108 (DESY–93-123C, pp. 115-120) **Radiative corrections to $e^+e^- \to \mu^+\mu^-$ and the top decay $t \to bW$ in the Two Higgs doublet model.** Hoang, A.H. (Inst. fuer Theoretische Teilchenphysik, Univ. Karlsruhe (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The process $e^+e^- \to \mu^+\mu^-$ has a very clear signature and provides an excellent reference process for other processes at the Next Linear Collider (NLC) with a center of mass energy of $\sqrt{s}$ = 500 GeV. We will present the influence of an extended Higgs sector with two Higgs doublets on muon pair production at 500 GeV and on the top quark decay $t \to bW$ at the one loop level. (orig.)

2109 (DESY–93-123C, pp. 121-138) **Charged Higgs boson discovery potential at a 500 GeV e⁺e⁻ linear collider.** Sopczak, A. (CERN, Geneva (Switzerland). PPE Div.). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The discovery potential for charged Higgs bosons has been studied with full-statistics background simulations for $\sqrt{s}$ = 500 GeV and L = 10 fb^{-1}. For the hadronic decay channels $H^+H^- \to$ c anti s anti cs, t anti b anti tb, a microvertex detector is crucial for establishing a signal over the $e^+e^- \to$ t anti t background. A combination with a search in the channels $H^+H^- \to$ c anti sτ^- anti ν, $\tau^+\nu_\tau\tau^-$ anti ν allows detection sensitivity for charged Higgs bosons up to a mass of about 210 GeV, independent of the charged Higgs decay modes. Sensitivity regions in the m_A-tan β parameter space of the Minimal Supersymmetric extention of the Standard Model (MSSM) are given. (orig.)

2110 (DESY–93-123C, pp. 147-153) **Gauge invariance in off-shell W pair production.** Aeppli, A. (Inst. fuer Theoretische Teichenphysik, Univ. Karlsruhe (Germany)); Cuypers, F.; Oldenborgh, G.J. van. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. Foerderkennzeichen BMFT 055KAP94P1. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Several schemes to introduce finite width effects to reactions involving unstable elementary particles are given and the differences

between them are investigated. The effects of the different schemes are investigated numerically for W pair production. In $e^+e^- \rightarrow W^+W^-$ we find that the effect of the non-resonant graphs cannot be neglected for $\sqrt{s} >$ or $\approx$ 400 GeV. Away from threshold, there is no numerical difference in the total cross section between the various schemes to add these to the resonant graphs, although some violate gauge invariance. On the other hand, in the reaction $\gamma\gamma \rightarrow W^+W^-$ the effect of the non-resonant graphs is large everywhere, because of the t-channel pole. Again, the scheme dependence is negligible here (in the unitary gauge). (orig.)

2111 (DESY–93-123C, pp. 153-158) **Approximation for on-shell W-pair production at high and intermediate energies.** Beenakker, W. (Theory Div., DESY, Hamburg (Germany)); Denner, A.; Dittmaier, S.; Mertig, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. Grant NATO CRG 900136. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication ELECTRON-POSITRON INTERACTIONS/ annihilation; QUANTUM ELECTRODYNAMICS/electron-positron interactions; THEORETICAL DATA; DIFFERENTIAL CROSS SECTIONS; ANNIHILATION; INTEGRAL CROSS SECTIONS; PAIR PRODUCTION; W PLUS BOSONS; W MINUS BOSONS; SPIN ORIENTATION; BORN APPROXIMATION; MATRIX ELEMENTS; ASYMPTOTIC SOLUTIONS; GEV RANGE 100-1000; TEV RANGE 01-10; PERTURBATION THEORY; HELICITY; ANGULAR DISTRIBUTION; ENERGY DEPENDENCE; EXCITATION FUNCTIONS; RADIATIVE CORRECTIONS

2112 (DESY–93-123C, pp. 159-164) **Initial stet radiation corrections to off-sheil W-pair production in e^+e^--annihilation.** Bardin, D. (Theory Div., CERN, Geneva (Switzerland)); Bilenky, M.; Olchevski, A.; Riemann, T. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication ELECTRON-POSITRON INTERACTIONS/ annihilation; QUANTUM ELECTRODYNAMICS/electron-positron interactions; RADIATIVE CORRECTIONS; ANNIHILATION; INTEGRAL CROSS SECTIONS; PAIR PRODUCTION; W PLUS BOSONS; W MINUS BOSONS; PHOTONS; PERTURBATION THEORY; BORN APPROXIMATION; DIFFERENTIAL CROSS SECTIONS; COULOMB CORRECTION; ENERGY DEPENDENCE; EXCITATION FUNCTIONS; GEV RANGE 100-1000; THEORETICAL DATA

2113 (DESY–93-123C, pp. 165-170) **WOPPER - a Monte Carlo event generator for W off-shell pair production including higher order electromagnetic radiative corrections.** Anlauf, H. (Inst. fuer Kernphysik, Darmstadt (Germany)); Manakos, P.; Mannel, T.; Dahmen, H.D. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication QUANTUM ELECTRODYNAMICS/electron-positron interactions; ANNIHILATION; INTEGRAL CROSS SECTIONS; MONTE CARLO METHOD; PAIR PRODUCTION; RADIATIVE CORRECTIONS; W CODES; COMPUTERIZED SIMULATION; W PLUS BOSONS; W MINUS BOSONS; GEV RANGE 100-1000; EXCITATION FUNCTIONS; ENERGY DEPENDENCE; LEPTONIC DECAY; ANGULAR DISTRIBUTION; PHOTONS; CHARGED PARTICLES; LEPTONS; THEORETICAL DATA

2114 (DESY–93-123C, pp. 171-176) **Gauge-boson production in electron-photon collisions.** Denner, A. (Theory Div., CERN, Geneva (Switzerland)); Dittmaier, S. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication PHOTON-ELECTRON INTERACTIONS/ photoproduction; PHOTON-ELECTRON INTERACTIONS/compton effect; ELECTRONS; GEV RANGE 10-100; INTEGRAL CROSS SECTIONS; PHOTONS; WEINBERG LEPTON MODEL; PHOTOPRODUCTION; QUANTUM ELECTRODYNAMICS; PERTURBATION THEORY; DIFFERENTIAL CROSS SECTIONS; ANGULAR DISTRIBUTION; GEV RANGE 100-1000; TEV RANGE 01-10; THEORETICAL DATA; Z NEUTRAL BOSONS; W MINUS BOSONS; ELECTRON NEUTRINOS; ENERGY DEPENDENCE; EXCITATION FUNCTIONS; RADIATIVE CORRECTIONS

2115 (DESY–93-123C, pp. 187-197) **Tests of trilinear couplings of the vector bosons at future e^+e^--collider.** Bilenky, M. (Dept. of Theoretical Physics, Univ. Bielefeld (Germany)); Schildknecht, D.; Kneur, J.L.; Renard, F.M. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We study the accuracy to be obtained in measuring trilinear $Z^0W^+W^-$ and γW^+W^- couplings in the reaction $e^+e^- \rightarrow W^+W^-$ at a "new linear collider" energies of 500GeV to 1000GeV. We derive a simple approximate formula which says that the sentitivity for the determination of these couplings increases as $\sqrt{s}$.L, where $\sqrt{s}$ denotes the center-of mass energy and L the integrated luminosity. Detailed investigations based on various fits confirm this simple estimate and show that an accuracy of the order of standard radiative corrections can be reached at NLC for designed values of luminosity. (orig.)

2116 (DESY–93-123C, pp. 199-205) **Single W production at NLC.** Papadopoulos, C.G. (Theory Div., CERN, Geneva (Switzerland)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We study the single W production at e^+e^- 500 GeV collider (NLC). We show that the sensitivity of the single-W production channel on the anomalous trilinear couplings of W is essentially the same as the sensitivity of the channel $e^+e^- \rightarrow W^+W^-$, and thus single W production should be included in anomalous couplings searches at future high-energy colliders. (orig.)

2117 (DESY–93-123C, pp. 207-213) **Trilinear and quadrilinear W couplings in triple vector production.** Belanger, G.; Boudjema, F. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication ELECTRON-POSITRON INTERACTIONS/ annihilation; QUANTUM FLAVORDYNAMICS/electron-positron interactions; ANNIHILATION; COUPLING; LAGRANGIAN FIELD THEORY; VERTEX FUNCTIONS; PAIR PRODUCTION; W PLUS BOSONS; W MINUS BOSONS; Z NEUTRAL BOSONS; PHOTONS; LIMITING VALUES; GEV RANGE 100-1000; COUPLING CONSTANTS; UNIFIED GAUGE MODELS

2118 (DESY–93-123C, pp. 215-228) **Anomalous selfinteractions of gauge bosons in WWZ and ZZZ production at NLC.** Ghinculov, A. (Freiburg Univ. (Germany). Fakultaet fuer Physik); Bij, J.J. van der. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We examine the possibility of measuring the anomalous selfcouplings of gauge bosons induced in the limit of infinite mass of the Higgs boson by dimension 4 invariant Lagrangians which break the custodial $SU(2)_R$ symmetry minimally in the processes $e^+e^- \rightarrow Z^0Z^0Z^0$ and $e^+e^- \rightarrow Z^0W^+W^-$ at $\sqrt{s}$ = 500 GeV. We estimate the limits NLC will be able to put on these couplings and address the question whether this measurement can reveal the low energy effects to be expected from strong selfinteractions of the spontaneous symmetry breaking system. (orig.)

2119 (DESY–93-123C, pp. 229-233) **Testing the anomalous ZZ$\gamma$and Z$\gamma\gamma$vertices in e$\gamma\rightarrow$eZ.** Cornet, F. (Dept. de Fisica Teorica y del Cosmos, Univ. de Granada (Spain)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The effects of anomalous ZZγ and Z$\gamma\gamma$ vertices in the process $e\gamma \rightarrow eZ$ are studied. An estimation of the sensitivity of an e^+e^- collider with a center of mass energy of 500 GeV working as an $e\gamma$ collider to these vertices is given. (orig.)

2120 (DESY–93-123C, pp. 249-253) **The top width: Theoretical update.** Jezabek, M. (Inst. of Nuclear Physics, Cracow (Poland)); Kuehn, J.H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

A critical assessment of the available calculations of the top quark width is presented. QCD corrections, the finite mass of the b quark and the effect of the W width are included as well as the electroweak corrections. The relative importance of these corrections is demonstrated for the realistic range of top masses. For the QCD corrected decay rate we use our formulae derived earlier (1989) and include the electroweak correction taken from A. Denner and T. Sack (1991). Our results differ from those available in the literature because all the later calculations ignored the effect of W width. This leads to an effect comparable in size to the electroweak correction. (orig.)

2121 (DESY–93-123C, pp. 255-260) **Energy of W distribution in top quark decays.** Jezabek, M. (Inst. of Nuclear Physics, Cracow (Poland)); Juenger, C. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

A relatively simple analytical formula is derived for the energy spectrum of W boson in top quark decays $t \rightarrow Wb$ including $O(\alpha_s)$ radiative corrections. We discuss the accuracy of this formula. A Monte Carlo algorithm for generation of W energy spectrum is briefly described. (orig.)

2122 (DESY–93-123C, pp. 261-268) **Supersymmetric decays of the top quark.** Borzumati, F.M. (2. Inst. fuer Theoretische Physik, Univ. Hamburg (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The supersymmetric decays of the top quark into charged Higgs plus bottom, $t \rightarrow H^+b$, and into the supersymmetric partner of the top (u_1) plus the lightest neutralino (χ_1)^0, $t \rightarrow u_1\chi_1{}^0$, are discussed within the framework of the Minimal Supersymmetric Standard Model with radiatively induced breaking of the gauge group SU(2) x U(1). The possibility of detecting these decays at present, i.e. given the available bounds on supersymmetric parameters, is compared with the situation a Next e^+e^- Linear Collider would face if supersymmetric particles were still undiscovered at LEP II. The indirect implications for $t \rightarrow H^+b$ and $t \rightarrow u_1$ anti ^{0} of a measurement of the bottom quark decay $b \rightarrow s\gamma$at the Standard model level are taken into account. (orig.)

2123 (DESY–93-123C, pp. 269-281) **Experimental aspects of rare top quark decays at future e⁺e⁻ linear colliders.** Venturi, A. (INFN, Pisa (Italy)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the sensitivity to detect two rare top quark decays, $t \rightarrow H^+b$ and $t \rightarrow t\chi^0$ in the framework of the minimal supersymmetric model, at a future 500 GeV e^+e^- Linear Collider. The analysis takes into account acceptances and resolutions of a realistic detector. It is found that with an integrated luminosity of $\approx$10-20 fb^{-1} (one "year= of running with $\int$Ldt=1-2x10^{33} cm^{-2}sec^{-1}), a good sensitivity can be achieved for both decays with simple event selections and standard requirements on the detector performance. (orig.)

2124 (DESY–93-123C, pp. 283-285) **Azimuthal distributions for the process e⁺e⁻→t anti t→$\mu^+\mu^-$X.** Lampe, B. (Max-Planck-Inst. fuer Physik, Werner-Heisenberg-Inst., Muenchen (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We present azimuthal distributions for the process $e^+e^- \rightarrow t$ anti $t \rightarrow \mu^+\mu^-X$. Their measurement would be a good check on whether the couplings between the top quark and the vector bosons are as predicted by the standard model. (orig.)

2125 (DESY–93-123C, pp. 287-295) **CP violation in top quark pair production.** Bernreuther, W. (Inst. fuer Theoretische Physik, Univ. Heidelberg (Germany)); Overmann, P. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss a few possibilities to search for CP violation in t anti t production by means of angular correations. Two CP asymmetries are calculated within Higgs boson and supersymmetric models of CP non-conservation. Two related CP-even quantities, which result from t and anti t polarization in and normal to the production plane, respectively, are also given. (orig.)

2126 (DESY–93-123C, pp. 297-301) **Higgs effects in top production.** Jezabek, M. (Inst. of Nuclear Physics, Cracow (Poland)); Kuehn, J.H. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Toponium and open top production are strongly enhanced by the exchange of a light Higgs boson. This enhancement exhibits a rapid energy variation. It is shown that the leading term can be absorbed in an instantaneous Yukawa potential. The remainder can again be evaluated in the static limit. (orig.)

2127 (DESY–93-123C, pp. 309-318) **Production and decay of t anti t pairs in the threshold region.** Jezabek, M. (Inst. of Nuclear Physics, Cracow (Poland)); Kuehn, J.H.; Teubner, T. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The Green function formalism is applied to t- anti t production and decay near threshold. The Lippmann-Schwinger equation is solved numerically for a chromostatic potential given by the two-loop QCD formula at large and by Richardson ansatz at intermediate and small momentum transfers. Effects are studied due to the momentum dependent width for t- anti t system. We point out that these effects are likely to be much smaller than expected from the reduction of the available phase space. We compare the results on the total cross section and top quark intrinsic momentum distributions with those obtained for the constant width. (orig.)

2128 (DESY–93-123C, pp. 319-329) **Measurements in the e^+e^-→t anti t threshold region.** Igo-Kemenes, P. (Physikalisches Inst., Univ. Heidelberg (Germany)); Martinez, M.; Miquel, R.; Orteu, S. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The possibility of using the top quark momentum distribution near the t anti t threshold to measure the top quark mass is investigated. The peak of the momentum distribution is found to be sensitive to m_t while insensitive to the strong coupling constant, α_s. It is also largely insensitive to beam properties such as the energy spread and bremsstrahlung. For m_t = 150 GeV and using an integrated luminosity of 10 fb^{-1} in an energy scan around threshold, the combined measurement of the t anti t cross section and the top quark momentum distribution allows a simultaneous determination of m_t and α_s with overall errors of 300 MeV and 0.006, respectively. (orig.)

2129 (DESY–93-123C, pp. 331-341) **Studies of QCD in e^+e^- collisions at 500 GeV.** Cowan, G.D. (Univ. Siegen, Fachbereich Physik (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The prospects for studying QCD at an e^+e^- collider with a center-of-mass energy of e_{cm}=500 GeV are reviewed. The topics covered include the measurement of the strong coupling α_s from jet rates, event-shape variables and scaling violations, prospects for finding evidence for new particles from the running of α_s, the interplay between top-quark decay and fragmentation, and soft gluon radiation from top-quark events. In addition, a proposal is made for an energy scan from PEP/PETRA energies ($E_{cm}\approx$30 GeV) to E_{cm}=500 GeV. (orig.)

2130 (DESY–93-123C, pp. 349-356) **Model independent constraints on extra Z bosons at a 500 GeV e^+e^- collider.** Leike, A. (DESY - Inst. fuer Hochenergiephysik, Zeuthen (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Model independent constraints on the mass of extra neutral gauge bosons and its couplings to charged leptons are given for a 500 GeV e^+e^- collider. Radiative corrections are included as well as the expected systematic and statistical errors. The known discovery limits on extra Z bosons predicted by particular models as, for example, the E_6 GUT or the Left Right Symmetric Model, are reproduced as special cases. The constraints are compared with those predicted by four fermion contact interactions. Polarized beams are only useful for degrees of polarization essentially larger than 50%. (orig.)

2131 (DESY–93-123C, pp. 357-365) **Z - Z' and exotic lepton mixing in e^+e^-→W^+W^- at high energy with polarized beams.** Pankov, A.A. (Physics Dept., Gomel Polytechnic Inst. (Belarus)); Paver, N. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss indirect manifestations of a heavy neutral boson Z' and of heavy leptons in the process e^+e^- → W^+W^- at the energies of planned next-generation e^+e^- colliders. Longitudinal polarization of initial $e^\pm$ beams significantly increases the sensitivity of cross sections to Z-Z' and lepton-exotic lepton mixing angles, due to the enhancement mechanism of "new" physical effects at high energy, so that stringent bounds could be derived in the various extended electroweak schemes. (orig.)

2132 (DESY–93-123C, pp. 367-379) **The BESS model at e^+e^- colliders.** Casalbuoni, R. (Florence Univ. (Italy). Dipt. di Fisica); Chiappetta, P.; Deandrea, A.; De Curtis, S.; Dominici, D.; Gatto, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We consider the possibility of detecting vector resonances from a strong electroweak sector, in the framework of the BESS model, at future e^+e^- colliders up to the TeV range. If the mass M_V of the new vector boson multiplet is not far above or if it is below the maximum machine energy, such a contribution would be manifest. The process of W-pair production by e^+e^- annihilation allows for sensitive tests of the strong sector, especially if the W polarizations are reconstucted. (orig.)

2133 (DESY–93-123C, pp. 381-395) **Strong resonances effects at future e^+e^- colliders.** Layssac, J. (Physique Mathematique et Theorique, CNRS-URA, Univ. Montpellier 2, 34 (France)); Renard, F.M.; Verzegnassi, C. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication ELECTRON-POSITRON INTERACTIONS/ annihilation; QUANTUM FLAVORDYNAMICS/electron-positron interactions; ANNIHILATION; GEV RANGE 100-1000; PAIR PRODUCTION; MUON PAIRS; MUONS PLUS; MUONS MINUS; ANGULAR DISTRIBUTION; ASYMMETRY; Z NEUTRAL BOSONS; CONFIGURATION MIXING; GRAND UNIFIED THEORY; INTEGRAL CROSS SECTIONS; NEUTRAL-CURRENT INTERACTIONS; LEPTONIC DECAY

2134 (DESY–93-123C, pp. 411-418) **Single production of new leptons.** Azuelos, G. (Lab. de Physique Nucleaire, Univ. Montreal, PQ (Canada)); Djouadi, A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the single production of new heavy leptons in association with their ordinary light partners. Signals and backgrounds are analyzed at a future high-energy e^+e^- linear collider with a center of mass energy of 500 GeV. (orig.)

2135 (DESY–93-123C, pp. 419-433) **Radiative corrections to leptoquark pair production in e^+e^- annihilation.** Bluemlein, J. (DESY - Inst. fuer Hochenergiephysik, Zeuthen (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

QED and QCD radiative corrections are calculated for the pair production cross sections of leptoquarks in e^+e^- annihilation. Large corrections are found for the production process near threshold. For β = 0.1 the QED corrections are of O(-40% to -50%). QCD corrections may reach O(+100%). (orig.)

2136 (DESY–93-123C, pp. 445-456) **Vector bosons and Higgs bosons as signatures for charginos and neutralinos.** Bartl, A. (Vienna Univ. (Austria). Inst. fuer Theoretische Physik); Majerotto, W. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We study in detail the production of charginos and neutralinos and their decays into vector bosons and Higgs particles in e^+e^- collisions at $\sqrt{s}$ = 500 GeV within the Minimal Supersymmetric Standard Model. These decays lead to interesting and in some cases unique signatures. They are an additional source of Higgs boson production. (orig.)

2137 (DESY–93-123C, pp. 457-473) **Aspects of scalar lepton search.** Becker, R. (Physikalisches Inst. 3A, RWTH Aachen (Germany)); Vander Velde, C. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The production and detection of charged sleptons at a 500 GeV e^+e^- collider has been studied over the SUSY parameter space, taking into account the bremsstrahlung and beamstrahlung effects, together with the detector acceptance and its performances. In the case of selectrons the consequences of the different decay schemes for the so called left-handed and right-handed states are also investigated. (orig.)

2138 (DESY–93-123C, pp. 475-490) **Discovering supersymmetry with electron and photon beams.** Cuypers, F. (Sektion Physik, Univ. Muenchen (Germany)); Oldenborgh, G.J. van; Rueckl, R. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Linear collider designs are optimized for e^+e^- collisions. However, from the physics point of view, linear colliders may also be advantageously operated in an e^-e^-, $e^-\gamma$ or $\gamma\gamma$ mode. These options, which have not been available up to now, will provide unique tests of the standard model and of physics beyond it. As an example, we review the prospects for discovering and studying supersymmetry at linear colliders in e^-e^-, $e^-\gamma$ and $\gamma\gamma$ collisions. In particular, we argue that e^-e^- scattering is much better suited than e^+e^- annihilation for discovering selectrons or charginos. (orig.)

2139 (DESY–93-123C, pp. 507-516) **T-odd asymmetry in chargino pair production processes.** Kizukuri, Yoshiki (Dept. of Physics, Tokai Univ., Hiratsuka (Japan)); Oshimo, Noriyuki. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

T-violating asymmetry in chargino pair production processes is studied in the Minimal Supersymmetric Standard Model. The asymmetry emerges at the tree level in the production of two different charginos, and could be as large as of order 10^{-2} in unpolarized electron beam experiments and 10^{-1} in polarized electron beam experiments. In the pair production of the same charginos, the asymmetry emerges through the electric and the weak "electric" dipole moments of the charginos at the loop level. Its magnitude is of order 10^{-4}. The consistency with the electric dipole moments of the neutron and the electron is also discussed. (orig.)

2140 (DESY–93-123C, pp. 525-528) **Uncertainties in in calculations of the $\gamma\gamma$minijet cross section.** Forshaw, J.R. (Theoretical Physics Div., Rutherford Appleton Lab., Chilton (United Kingdom)); Storrow, J.K. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Short communication PHOTON-PHOTON INTERACTIONS/ multiple production; JET MODEL/photon-photon interactions; QUANTUM CHROMODYNAMICS/photon-photon interactions; TOTAL CROSS SECTIONS; PHOTOPRODUCTION; FEYNMAN DIAGRAM; MULTIPLE SCATTERING; ENERGY DEPENDENCE; EXCITATION FUNCTIONS; DISTRIBUTION FUNCTIONS; EIKONAL APPROXIMATION; GEV RANGE 100-1000; HADRONS; THEORETICAL DATA

2141 (DESY–93-123C, pp. 529-559) **Pair neutral gauge boson production and Higgs signal in γ-γcollisions: $\gamma\gamma\to\gamma\gamma$, $\gamma\gamma\to$ ZZ, $\gamma\gamma\to$ HH.** Jikia, G. (Inst. for High Energy Physics, Protvino (Russian Federation)); Tkabladze, A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

Reactions of neutral gauge and Higgs boson pair production in photon-photon collisions are considered on the basis of complete one-loop Standard Model (SM) calculations. (orig.)

2142 (DESY–93-123C, pp. 561-587) **W, Z and H bosons in the three particle final states production at TeV energy γe and $\gamma\gamma$colliders.** Boos, E.E. (Nuclear Physics Inst., Moscow State Univ. (Russian Federation)); Dubinin, M.N.; Ilyin, V.A.; Pukhov, A.E. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327–: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e⁺e⁻ collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The short review of complete tree level calculations for three particle final states production at the future e^+e^-, γe and $\gamma\gamma$ colliders is presented. The results obtained with the help of CompHEP system for total cross sections and other characteristics of processes in the energy range 0.1-2 TeV are summarized and their comparison with the results of different approaches is discussed. In particular we are interested in the processes of W, Z and H boson production. The reactions under consideration are especially interesting in connection with probing of new couplings, searching for new particle signals and as an important backgrounds to these experiments. The main subjects described are basic reactions rates (sections 2,3), Higgs production in γe collisions (section 4), the possibilities of testing some four vector bosons interaction vertices and Higgs-fermion coupling (section 5), the process of excited neutrino production with the Standard Model backgrounds (section 6). (orig.)

2143 (DESY–93-196) **Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha_s^2)$.** Salesch, S.G. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. 103p. (In German). Order Number DE95711697. Source: OSTI; NTIS (US Sales Only); INIS.

The complete first corrections of the QCD perturbation theory to several observables of inclusive jets in resolved photoproduction at HERA are determined, The inclusive one-Jet cross section in $O(\alpha\alpha_s^2)$ is decomposed according to a method of Aversa et al. into an analytical and a numerically accessible contribution. In the analytical part the occurring singularities are removed by addition of all O(alpha$_s^3$) corrections respectively absorption into the parton distributions. Hereby all finite contributions in the jet cut can be neglected. They are numerically determined in the second step by means of usual Monte-Carlo procedures. The relevant properties of the inclusive one-jet cross section are extensively discussed, whereby also parallels to the hadroproduction on p anti p colliders are shown. The structure of the internal jet structure follows. The E_T profile is suitably defined, so that only (2→3) tree graphs contribute. This permits the then following numerical evaluation. Universal properties of the jet structure are shown, especially at

sufficiently low relative transverse energy of the jet (x_T) the differences to the comparable profile in hadroproduction at Tevatron energies can be by the current coupling simply factorized. Some analytical relations between jet profile and cross section are discussed.

2144 (DESY–94-111) **Measurement of the decay fractions of D* mesons.** Albrecht, H.; Ehrlichmann, H.; Hamacher, T.; Hofmann, R.P.; Kirchhoff, T.; Mankel, R.; Nau, A.; Nowak, S.; Ressing, D.; Schroeder, H.; Schulz, H.D.; Walter, M.; Wurth, R.; Hast, C.; Kapitza, H.; Kolanoski, H.; Kosche, A.; Lange, A.; Lindner, A.; Schieber,.ARGUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1994. 22p. Order Number DE95715230. Source: OSTI; NTIS (US Sales Only); INIS.

Using the ARGUS detector at the DORIS II electron-positron storage ring at DESY, we have measured $BR(D^{*+}\rightarrow D^0\pi^+)=(68.8\pm3.6\pm1.9)\%$. $BR(D^{*+}\rightarrow D^+\pi^0)=(31.2\pm1.6\pm1.0)\%$, $BR(D^{*+}\rightarrow D^+\gamma)<5.2\%$ (90%CL). $BR(D^{*0}\rightarrow D^0\pi^0)=(59.6\pm3.5\pm2.8)\%$, and $BR(D^{*0}\rightarrow D^0\gamma)=(40.4\pm3.5\pm2.8)\%$, and the mass difference $\Delta m_0=m(D^{*0})-m(D^0)=(142.2\pm0.3\pm0.2)MeV/c^2$. (orig.)

2145 (DESY–94-117) **Comparison of energy flows in deep inelastic scattering events with and without a large rapidity gap.** Derrick, M. (Argonne National Lab., IL (United States)); Krakauer, D.; Magill, S.; Musgrave, B.; Repond, J.; Schlereth, J.; Stanek, R.; Talaga, R.L.; Thron, J.; Arzarello, F.; Ayad, R.; Bari, G.; Basile, M.; Bellagamba, L.; Boscherini, D.; Bruni, A.; BruniZEUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1994. 19p. Order Number DE95715241. Source: OSTI; NTIS (US Sales Only); INIS.

Energy flows in deep inelastic electron-proton scattering are investigated at a centre-of-mass energy of 296 GeV for the range $Q^2\geq10$ GeV^2 using the ZEUS detector. A comparison is made between events with and without a large rapidity gap between the hadronic system and the proton direction. The energy flows, corrected for detector acceptance and resolution, are shown for these two classes of events in both the HERA laboratory frame and the Breit frame. From the differences in the shapes of these energy flows we conclude that QCD radiation is suppressed in the large-rapidity-gap events compared to the events without a large rapidity gap. (orig.)

2146 (DESY–94-121) **A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S).** Albrecht, H.; Hamacher, T.; Hofmann, R.P.; Kirchhoff, T.; Mankel, R.; Nau, A.; Nowak, S.; Ressing, D.; Schroeder, H.; Schulz, H.D.; Walter, M.; Wurth, R.; Hast, C.; Kapitza, H.; Kolanoski, H.; Kosche, A.; Lange, A.; Lindner, A.; Schieber, M.; Siegmund, T.;ARGUS Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Jul 1994. 22p. Order Number DE95711194. Source: OSTI; NTIS (US Sales Only); INIS.

The partial decay width into electrons, Γ_{ee}, of the Y(1S) and Y(2S) resonances have been measured with the detector ARGUS at the e^+e^- storage ring DORIS II of DESY. Applying the formula of Kuraev and Fadin for the radiative corrections we find: $\Gamma_{ee}(Y(1S)) = (1.32 \pm 0.04 \pm 0.03)$ keV and $\Gamma_{ee}(Y(2S)) = (0.52 \pm 0.03 \pm 0.01)$ keV. The total decay width of the Y(4S) resonance and its partial width into electrons have been determined as well. Fitting the data with a generalized Breit-Wigner function with an energy dependent decay width $\Gamma(s)$ and a mass shift function m(s), we obtain the following resonance parameters: $\Gamma(M^2) = (10.0 \pm 2.8)$ MeV, $\Gamma_{ee} = (0.28 \pm 0.05)$ keV and $B_{ee} = (2.77 \pm 0.50).10^{-5}$. (orig.)

2147 (DESY–94-137) **Physics from the first year of H1 at HERA.** Kiesling, C. (Max-Planck-Institut fuer Physik, Muenchen (Germany)). H1 Collaboration. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Aug 1994. 61p. (CONF-930767–: 21. annual SLAC Summer Institute on particle physics: spin structure in high-energy processes, Stanford, CA (United States), 26 Jul - 6 aug 1993; MPI-Phe–94-20). Order Number DE95715037. Source: OSTI; NTIS (US Sales Only); INIS.

In this report we summarize the results from the H1 experiment at HERA, using the data from the first year of running, 1992, where an integrated luminosity of 25 nb^{-1} has been recorded. These results include photoproduction, the measurement of the deep inelastic scattering, both for neutral current reactions, and the search for physics beyond the standard model. Apart from the measurement of a moderate rise in the total photoproduction cross section, clear evidence is seen for hard interactions in single particle spectra and jet production, requiring a "resolved" photon as expected is QCD. The investigation of the global properties of hadronic final states in deep inelastic scattering demonstrates the need for further improvement of present QCD models. Evidence is found for a class of events with diffractive characteristics, exhibiting a large gap of hadronic energy flow about the proton direction. The proton structure function $F_2^p(x,Q^2)$ has been measured for neutral current events for Bjorken x in the range 10^{-4} - 10^{-2} and $Q^2 > 5$ GeV^2, showing a steep rise towards small x. Furthermore, using 1993 data, a measurement of the cross section for charged current events is presented, clearly demonstrating, for the first time, the propagator effect of the W boson. Finally, new limits on leptoquarks, leptogluons, and excited electrons have been determined. (orig.)

2148 (DOE/ER/02504–391) **Two-photon physics: Physics Publication No. 83-175.** Polvado, R.O. Maryland Univ., College Park, MD (United States). Dept. of Physics and Astronomy. Oct 1982. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-76ER02504. (CONF-8210113–4: American Physical Society meeting on particles and fields, College Park, MD (United States), 28-30 Oct 1982). Order Number DE94014070. Source: OSTI; NTIS; GPO Dep.

A brief overview of $\gamma\gamma$ physics is presented. Two-body final states are considered and a preliminary result on non-resonant $\gamma\gamma\rightarrow h^-h^+$ (h = π, K, p) is given. The most recent results on the η', f^o, A_2, and f' resonances are tabulated and the status of $\gamma\gamma\rightarrow\rho_o\rho^o$ is discussed. The measurements of F_2 and high $p_\perp$ jets are summarized.

2149 (DOE/ER/40561–137) **Boron neutrino flux and the MSW solution of the solar neutrino problem.** Krastev, P.I. (North Carolina Univ., Chapel Hill, NC (United States)); Smirnov, A.Y. Fermi National Accelerator Lab., Batavia, IL (United States); Washington Univ., Seattle, WA (United States). Inst. for Nuclear Theory; North Carolina Univ., Chapel Hill, NC (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561 ; FG05-85ER40219. (FNAL/Pub–94/179-T). Order Number DE95001861. Source: OSTI; NTIS; INIS; GPO Dep.

There are large uncertainties in the predictions of the boron neutrino flux from the Sun which cannot be considered as being of purely statistical origin. We treat the magnitude of this flux, Φ_B, as a parameter to be found from experiment. The properties of the, MSW solution to the solar neutrino problem for different values of Φ_B are studied. Present, data give the bounds: $0.38 < \Phi_B/\Phi_B^O < 3.1$ (2σ), where $\Phi_B^O \equiv 5.7 \cdot 10^6$ cm^{-2}s^{-1} is the flux in the reference SSM. The variations of the flux in this interval enlarge the allowed region of mixing angles: $\sin^2 2\theta = 0.2 \div 2 \cdot 10^{-4} \div 2 \cdot 10^{-2}$ (small mixing solutions) and $\sin^2 2\theta = 0.2 \div 0.85$ (large mixing solution). If the value of the original boron neutrino flux is about that measured by Kamiokande, a consistent description of the data is achieved for $\sin^2 2\theta \sim (0.8 \div 2) \cdot 10^{-3}$ ("very small mixing solution"). The solution is characterized by a strong suppression of the beryllium neutrino line, a weak distortion of the high energy part of the baron neutrino spectrum and a value of the double ratio $(CC/NC)^{exp}/(CC/NC)^{SSM}$ at $E > 5$ MeV close to 1. We comment on the possibility to measure the neutrino parameters and the original boron neutrino flux in future experiments.

2150 (FNAL/C–94/216-E) **Measurement of the polarization in the decay $B^0 \rightarrow J/\psi K^{*0}$ in $\bar{p}p$ collisions at $\sqrt{s}$ = 1.8 TeV.** Ohl, K.E. (Yale Univ., New Haven, CT (United States). Dept. of Physics). CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–47: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002521. Source: OSTI; NTIS; INIS; GPO Dep.

We report on a measurement of data of the polarization in the decay $B^0 \rightarrow J/\psi K^{*0}$ using data collected at the Collider Detector at

Fermilab in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV. B^0 mesons were reconstructed through the decay chain $B^0 \rightarrow J/\psi K^{*0}$, $J/\psi \rightarrow \mu^+\mu^-$, $K^{*0} \rightarrow K^+\pi^-$. The results, based on a sample of 60 ± 11 events, is $\Gamma_L/\Gamma = 0.66 \pm 0.10$ (stat) $^{+0.08}_{-0.10}$ (sys).

2151 (FNAL/C–94-274-E) **Measurement of the B cross section at CDF via B semileptonic decays.** Lewis, J. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–41: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002217. Source: OSTI; NTIS; INIS; GPO Dep.

Using data collected during the 1992–1993 collider run at Fermilab, CDF has reconstructed several hundred charmed mesons (D^0, D^+ D^{*+} and D_s) in association with leptons from B semileptonic decays. We report on a measurement of the cross section of B and B_s mesons as a function of transverse momentum using this sample. The observation of a charmed meson eliminates many systematic uncertainties in the background subtraction inherent in previous measurements from inclusive lepton samples, and allows the backgrounds to be measured from the data. The B meson p_T range probed by the lepton + charm technique is 18 GeV and above, and thus these measurements complement similar measurements at lower p_T in the fully exclusive channels $B \rightarrow J/\psi K$ and $B \rightarrow J/\psi K^*$. Results are compared to other Tevatron measurements and Next-To-Leading-Order QCD predictions.

2152 (FNAL/C–94/325-E) **Charmonium production, b quark and B meson production and $b\bar{b}$ correlations at CDF.** Byrum, K. (Argonne National Lab., IL (United States)). Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940722–30: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95002525. Source: OSTI; NTIS; INIS; GPO Dep.

We present results on charmonium production, b quark and B meson production and $B\bar{B}$ correlations using data taken with the CDF detector at Fermilab in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV during the 1992–1993 collider run.

2153 (FNAL/C–94-336-E) **Studies of prompt photon production and multijet production at the Tevatron Collider.** Buckley-Geer, E. CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940722–29: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95002216. Source: OSTI; NTIS; INIS; GPO Dep.

We present measurements of inclusive isolated prompt photon production in $p\bar{p}$ collisions at a center-of-mass energy of 1.8 TeV from the Fermilab experiments CDF and D0. Precision measurements of prompt photon production fro CD constrain the gluon distribution, and recent results from D0 agree with CDF and QCD predictions. We also present studies of events with up to six jets in the final state from the CDF experiment. The mass distributions and mass ratio for these events is well described by the HERWIG parton shower Monte Carlo and by leading order QCD. Finally we present studies by both CDF and D0 of events with three jets in the final state.

2154 (FNAL/C–94/341-E) **Measurement of W and Z production cross-sections in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV.** Quintas, P.Z. D0 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–40: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002250. Source: OSTI; NTIS; INIS; GPO Dep.

The cross sections for W and Z production in $p\bar{p}$ collisions at $\sqrt{s}$ = 1.8 TeV are measured using the D0 detector at the Fermilab Tevatron collider. The detected final states are $W \rightarrow e\nu_e$, $Z \rightarrow e^+e^-$, $W \rightarrow \mu\nu_\mu$, and $Z \rightarrow \mu^+\mu^-$. In the ratio of these measurements, many common sources of systematic error cancel and we measure $R = \sigma_{\cdot}(p\bar{p} \rightarrow W) \cdot Br(W \rightarrow l\nu)/\sigma_{\cdot}(p\bar{p} \rightarrow Z) \cdot Br(Z \rightarrow l^+l^-)$. Assuming standard model couplings, this result is used to determine the width of the W bosom and to set a limit on the decay $W^+ \rightarrow t\bar{b}$.

2155 (FNAL/C–94/343-E) **Search for Centauro events in the DO Detector at Fermilab collider.** Rao, M.V.S. (Tata Inst. of Fundamental Research, Bombay (India)). DO Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 14p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);CEA, 75 - Paris (France). DOE Contract AC02-76CH03000. (CONF-9407127–2: 8. international symposium on very high energy cosmic ray interactions, Tokyo (Japan), 24-31 Jul 1994). Order Number DE95002522. Source: OSTI; NTIS; INIS; GPO Dep.

We report preliminary results of a Monte Carlo study to search for Centauro events in the DO Detector at Fermilab. Montecarlo simulation of minimum bias events are being carried out using the ISAJET and DOGEANT packages to study the detector response for low energy particles and to understand the background. Preliminary indications are that the detector is capable of resolving individual particles. Further work on developing reconstruction algorithms for individual particles is in progress.

2156 (FNAL/C–94/345-E) **Recent results from E665.** Kotwal, A.V. (Harvard Univ., Cambridge, MA (United States). Dept. of Physics). E665 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-9406265–2: 6. Rencontres de Blois: the heart of the matter, Orsay (France), 10-25 Jun 1994). Order Number DE95002523. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary measurements of the structure functions F_2^p and F_2^d and the structure function ratio F_2^n/F_2^p, in inelastic μN scattering are presented. Preliminary results on nuclear transparency (σ^A/A)/σ^H in incoherent exclusive ρ production are also presented. The data were obtained by Fermilab experiment 665 using a 465 GeV muon beam and liquid hydrogen, deuterium and carbon, calcium and lead targets. The structure functions are measured in the range $x_{Bj} > 8 \times 10^{-4}$ and $Q^2 > 0.2$ GeV^2. The structure function ratio is presented as a function of x_{Bj} for $x_{Bj} > 10^{-6}$. The nuclear transparency in exclusive ρ production is studied as a function of Q^2 in the range $0.1 < Q^2 < 10.0$ GeV^2.

2157 (IC–93/216) **Annihilation diagrams in two-body nonleptonic decays of charmed mesons.** Bedaque, P. (International Centre for Theoretical Physics, Trieste (Italy)); Das, A.; Mathur, V.S. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 9p. Grant DE-FG-02-91ER40685. (UR–1316; ER–40685-766.). Order Number DE95607181. Source: OSTI; NTIS (US Sales Only); INIS.

In the pole-dominance model for the two-body nonleptonic decays of charmed mesons $D \rightarrow PV$ and $D \rightarrow VV$, it is shown that the contributions of the intermediate pseudoscalar and the axial-vector meson poles cancel each other in the annihilation diagrams in the chiral limit. In the same limit, the annihilation diagrams for the $D \rightarrow PP$ decays vanish independently. (author). 6 refs, 3 figs.

2158 (IC–94/154) **Model independent QED corrections to the process $ep \rightarrow eX$.** Akhundov, A. (International Centre for Theoretical Physics, Trieste (Italy)); Bardin, D.; Kalinovskaya, L.; Riemann, T. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 112p. (DESY–94-115; CERN-TH–7339/94.). Order Number DE95607173. Source: OSTI; NTIS (US Sales Only); INIS.

We given an exhaustive presentation of the semi-analytical approach to the model independent leptonic QED corrections to deep inelastic neutral current lepton-nuclear scattering. These corrections include photonic Bremsstrahlung from and vertex corrections to the lepton current of the order $o(\alpha)$ with soft photon exponentiation. A common treatment of these radiative corrections in several variables-leptonic, hadronic, mixed, Jaquet-Blondel variables - has been developed and double differential cross-sections are calculated. In all sets of variables we use some structure functions, which depend on the hadronic variables and which do not have to be defined in the quark parton model. The remaining numerical integrations are twofold (for leptonic variables) or one fold (for all other variables). For the case of hadronic variables, all phase

space integrals have been performed analytically. Numerical results are presented for a large kinematical range, covering fixed target as well as collider experiments at HERA or LEP x LHC, with a special emphasis on HERA physics. (author). 77 refs, 42 figs, 1 tab.

2159 (IC–94/174) **Scalar three body decays and signals for new physics.** Adhikari, R. (Mehta Research Inst., Allahabad (India)); Mukhopadhyaya, B. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 12p. Order Number DE95607188. Source: OSTI; NTIS (US Sales Only); INIS.

If massive invisible particles are pair-produced in a three-body decay, then the energy distribution of the other (visible) product is sensitive to the mass of the invisible pair. We use this fact in the context of a Higgs boson decaying into (i) a Z-boson and two massive neutrinos of a fourth generation, and (ii) a Z and two lightest supersymmetric particles in the minimal supersymmetric standard model. We discuss how the Z-energy spectrum in each case can reflect the values of the parameters of such models. (author). 18 refs, 3 figs.

2160 (IC–94/203) **Radiative corrections for pion polarizability experiments.** Akhundov, A.A. (International Centre for Theoretical Physics, Trieste (Italy)); Gerzon, S.; Kananov, S.; Moinester, M.A. International Centre for Theoretical Physics, Trieste (Italy). Aug 1994. 12p. (TAUP–2183-94.). Order Number DE95607177. Source: OSTI; NTIS (US Sales Only); INIS.

We use the semi-analytical program RCFORGV to evaluate radiative corrections to one-photon radiative emission in the high-energy scattering of pions in the Coulomb field of a nucleus with atomic number Z. It is shown that radiative corrections can simulate a pion polarizability effect. The average effect is $\alpha^{rc}{}_{\pi}=-\beta^{rc}{}_{\pi}=(0.20\pm0.05) \times 10^{-43}$ cm^3, for pion energies 40-600 GeV. We also study the range of applicability of the equivalent photon approximation in describing one-photon radiative emission. (author). 21 refs, 6 figs, 1 tab.

2161 (IPNO-DRE–94-10) **Δ decay and absorption in nuclei.** Rousteau, S. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Ramstein, B.; Boyard, J.L.; Morsch, H.P.; Gosset, J.; Lemaire, M.C.; Dahl, R.; Ellegaard, C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. [12p.] Order Number DE95607184. Source: OSTI; NTIS (US Sales Only); INIS.

Data are presented on the decay and absorption of the Δ resonance excited in ^{1}H, ^{2}H, ^{4}He, ^{12}C and ^{208}Pb by the (^{3}He, t) reaction at 2 GeV incident energy. The quasi-free Δ decay and the absorption process on a (p,n) pair are clearly observed. Evidence is also found for coherent pion production. (authors). 16 refs., 6 figs., 1 tab.

2162 (IPNO-TH–92-109) **Inelastic leptoproduction of J/ψ.** Merabet, H. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Mathiot, J.F.; Mendez-Galain, R. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1993. [36p.] Order Number DE95607156. Source: OSTI; NTIS (US Sales Only); INIS.

The inelastic leptoproduction cross-section of J/ψ is reexamined in the framework of the color singlet model. The Q^2-dependence of the cross section is calculated exactly and these results are compared with existing muoproduction data from CERN. Predictions are also made for the high energy (HERA) as well as low energy (30 GeV electron beam on a fixed target) regimes. The exact calculation of the Q^2-dependence of the cross-section is essential to extract the gluon distribution function from data. It is found that using the exact leptoproduction cross-section amounts to increase the power of the gluon distribution function extracted so far in muoproduction experiments. (authors). 24 refs., 11 figs., 1 tab.

2163 (IPNO-TH–93-31) **Relativistic effects in the scalar meson dynamics.** Kaminski, R. (Institute of Nuclear Physics, Krakow (Poland). Dept. of Theoretical Physics); Lesniak, L.; Maillet, J.P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jul 1993. 35p. Order Number DE95607178. Source: OSTI; NTIS (US Sales Only); INIS.

A separable potential formalism is used to describe the $\pi\pi$ and KK-bar interactions in the energy range from the $\pi\pi$ threshold up to 1.4 GeV. Introduction of relativistic propagators into a system of Lippmann-Schwinger equations leads to a very good description of the data. Three resonances are found in this energy region: $f_0(500)$, $f_0(975)$ and $f_0(1400)$. The $f_0(975)$ state can be interpreted as a KK-bar bound state. The $f_0(500)$ state may be associated with the often postulated very broad scalar resonance under the KK-bar threshold (sometimes called σ or ϵ meson). The scattering lengths in the $\pi\pi$ and KK-bar channels have also been obtained. (authors). 51 refs., 5 figs., 6 tabs.

2164 (IPNO-TH–93-47) **Effective Lagrangian with vector mesons: Linear response theory.** Abada, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Oct 1993. 10p. (LPN–93-12.). Order Number DE95607182. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physics Letters, B (NL).

The soliton breathing model is investigated in the framework of linear response theory within a Skyrme model vector meson stabilized. The effective Lagrangian considered includes the ρ (introduced following the standard prescription of nonlinear chiral symmetry) and the ω mesons. The monopole response function is found to have a pronounced peak which is identified to the P11 (Roper) resonance. The results are compared to those obtained within the local approximation. (author). 19 refs., 2 figs.

2165 (IPNO-TH–93-72) **On the coherence between high-energy total cross-section data when compared with general principles.** Gauron, P. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Nicolescu, B. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Dec 1993. [15p.] Order Number DE95607179. Source: OSTI; NTIS (US Sales Only); INIS.

An essential model is performed - an independent study of the internal coherence between high-energy total cross-section data by using classes of functions satisfying general principles. The study is practically independent of the ρ-parameter values. This general analysis, made without any fit, reveals certain inconsistencies in the existing set of high-energy data. Some of these inconsistencies are eliminated by giving up arbitrary assumptions sometimes made in 'fitology'. It is shown that the $\ln^2 s$ increase of total cross-sections at high energies is clearly favoured when compared with other possible behaviours. (authors). 16 refs., 3 figs.

2166 (IPNO-TH–94-08) **The reaction $\gamma\gamma \rightarrow \pi^0\pi^0$ in generalized chiral perturbation theory.** Knecht, M.; Moussallam, B.; Stern, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jan 1994. [30p.] Order Number DE95607192. Source: OSTI; NTIS (US Sales Only); INIS.

The cross section for $\gamma\gamma \rightarrow \pi^0\pi^0$ and the pion polarizabilities are computed, within generalized chiral perturbation theory, in the full one loop approximation, i.e. up to and including order $O(p^5)$. The result depends on the parameter $\alpha_{\pi\pi}$ defining the tree level π-π scattering amplitude and on an additional low energy constant. The latter is shown to be related by an exact sum-rule to the e^+e^- data. The parameter $\alpha_{\pi\pi}$ is related to the quark mass ratio $r=m_s/m$ via the expansion of pseudoscalar meson masses. Higher order corrections are estimated comparing the calculation with the dispersive approach. (authors). 35 refs., 6 figs., 1 tab.

2167 (JAERI-M–94-028, pp. 25-29) **Two-nucleon and meson-two-nucleon systems at intermediate energies.** Ueda, Tamotsu (Ehime Univ., Matsuyama (Japan). Faculty of Science). Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

In order to describe meson-two-nucleon system, one needs the framework of the three-body dynamics based on Faddeev formalism. Especially three-body resonances in this system are able to be described just by this dynamics. We review a three-body approach to the resonances of the πNN and ηNN systems. (J.P.N.).

2168 (Juel–2877) **Measurement of the reaction anti pp$\rightarrow\Phi\Phi$ at the experiment JETSET.** Steinkamp, O. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Kernphysik; Bonn Univ. (Germany). Feb 1994. 150p. (In German). Order Number DE95711672. Source: OSTI; NTIS (US Sales Only); INIS.

The experiment Jetset examines the reactions anti pp→ΦΦ with an internal target at LEAR (CERN), whereby the Φ mesons are each detected by their decay into two charged kaons. An evaluation chain was development for the reconstruction of events of the type anti pp→$K^+K^-K^+K^-$ as well as the extraction of a signal of the resonant production anti pp→ΦΦ→$K^+K^-K^+K^-$. JETSET took the first data during three beam times in the year 1991, whereby the region from 1.2 GeV/c t0 2.0 GeV/c beam momentum were studied in steps of 100 MeV/c as well as the region between 1.39 GeV/c and 1.5 GeV/c beam momentum in steps of 15 MeV/c. The application of the described evaluation to these data yielded over the whole measured energy range a distinct ΦΦ signal, which dominates clearly over the background of non-resonant 4K production. Luminosities were determinded from the measurement of the known cross section for elastic anti pp scattering. Momentaneous luminosities of (3-4)x10^{29} $cm^{-2}s^{-1}$ resulted. The integrated measured luminosities for the single measuring points varied between 8 nb^{-1} and 32 nb^{-1}. Total " ΦΦ yields" were determined under the assumption of a flat differential cross section over the whole angular range to (1-2) μb. For partial ΦΦ yields in the confined polar angular range $|\cos\theta_{cm}| < 0.5$, over which the acceptance of the detector is nearly constant, values between 0.5 μb and 1 μb reulted. Really the measured production cross sections at the lower c. m. energies are compatible with a flat slope, but with increasing c. m. energy an increaing contribution of higher-order terms in $\cos\theta_{cm}$ is indicated, as the fit by second-order polynomials to the angular distributions measured in the accessibler polar angular range shows.

2169 (KEK-PROC–93-22, pp. 342-349) **Measurement of inclusive electron cross section in $\gamma\gamma$ collisions.** Iwasaki, Masako (Nara Women's Univ. (Japan). Dept. of Physics). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

We have studied the open charm production in $\gamma\gamma$ collisions using an inclusive electron sample obtained by the TOPAZ detector at TRISTAN e^+e^- collider. The cross section of the inclusive electron production in $\gamma\gamma$ collisions was measured and compared with theoretical predictions based on the direct process $\gamma\gamma \rightarrow$ cc-bar and the sum of the direct and resolved photon process. The data show clear excess over the prediction of the direct process. The sum of the direct and resolved process can reproduce the data in the low-Pt region of electrons if the LAC1 parametrization is taken for the parton distribution in the photon with a relatively low c-quark mass of 1.3 GeV. The DG parametrization can not explain the data. (author).

2170 (KEK-PROC–93-22, pp. 350-358) **Inclusive K_s^0 production in two photon processes.** Miyata, H. (Niigata Univ. (Japan). Dept. of Physics); Shirai, M.; Miyano, K.; Sasaki, T.; Nozaki, T. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

The inclusive transverse momentum distribution of K_s^0 produced in untag $\gamma\gamma$ collisions was measured with the AMY detector. The result was compared to model calculations based on the vector dominance model, the direct process, and the resolved photon processes, up to a P_t of 3 GeV/c. The result was consistent with the theoretical prediction. (author).

2171 (KEK-PROC–93-22, pp. 359-368) **$D^{*\pm}$ production in two-photon process.** Ohyama, Hiroshi (Hiroshima Univ. (Japan). Dept. of Physics). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

We have investigated inclusive production of $D^{*\pm}$ mesons in two-photon process by using the VENUS detector. The $D^{*\pm}$ mesons are reconstructed through their decay chain $D^0+\pi^\pm$ and $D^0 \rightarrow K^\pm+\pi^\pm$. The yield is compared with the value expected with the direct cc-bar production process and the production through gluon-gamma fusion in resolved photon process. (author).

2172 (KEK-PROC–93-22, pp. 369-381) **Measurement of the $D^{*\pm}$ cross section using a soft-pion analysis in two-photon processes.** Enomoto, R. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)); Abe, K.; Abe, T. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

The differential cross section of $d\sigma(D^{*\pm})/dP_T$ was measured using a soft-pion analysis of $D^{*\pm} \rightarrow \pi_s{}^\pm D^0(e^+e^- \rightarrow e^+e^-D^{*\pm}X)$ at TRISTAN. The average $\sqrt{s}$ was 58.1 GeV and the integrated luminosity used in this analysis was 198 pb^{-1}, respectively. The measured cross section was larger than the theoretical prediction in the high-P_T region (>3.6 GeV) by 3.5σ. (author).

2173 (KEK-PROC–93-22, pp. 383-404) **Can stop be light enough for TRISTAN?.** Kon, Tadashi (Seikei Univ., Musashino, Tokyo (Japan)); Nonaka, Toshihiko. National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

We examine a possibility for existence of a light supersymmetric partner of the top quark (stop) with mass 15-16GeV in the framework of the minimal supergravity GUT model. Such light stop could explain the slight excess of the high P_T cross section of the $D^{*\pm}$-meson production in two-photon process at TRISTAN. We point out that the existence of such stop could change the dominant decay mode of the gluino and could weaken present experimental bound on the mass of gluino. It seems that there is a finite parameter region allowing existence of the light stop even if we consider the present experimental data. Inversely, if the light stop was discovered at TRISTAN, masses and mixing parameters of the other SUSY partners as well as masses of the Higgs and the top will be severely constrained, for example, $m_{gtilde} \simeq$ 85GeV, $m_{Wtilde1} <$ or approx 50GeV, 110GeV < or approx $m_{ltilde} <$ or approx 140GeV, 120GeV < or approx $m_{qtilde} <$ or approx 160GeV, $\theta_t \simeq 0.9$, $m_h <$ or approx 65GeV and 130GeV < or approx $m_t <$ or approx 140Gev. We also discuss briefly the proton decay and the dark matter constraints. (author).

2174 (KEK-PROC–93-22, pp. 405-417) **A light scalar top search by venus detector.** Shirai, J. (National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

A search for the light scalar top quark (t $tilde_1$) which may couple very weakly to the Z^o boson has been carried out with the VENUS detector at TRISTAN. Assuming the two-body decay of the t $tilde_1$ into a charm quark and a neutralino, a data sample of 210 pb^{-1} has been analyzed to find events with large acoplanar particle groups. With a successful rejection of the backgrounds mainly coming from 2γ reaction, the search region has been extended up to the one very close to the kinematical limit. The observed number of events is consistent with that expected from the known processes and we obtained the mass limits in ($M_{ttilde1}$, $M_{Ztilde1}$) space at 95% CL. (author).

2175 (KEK-PROC–93-22, pp. 418-429) **A study of single photon production with the TOPAZ detector.** Abe, Toshinori (Nagoya Univ. (Japan). Dept. of Physics). National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan). Mar 1994. (CONF-9311226–: 2. workshop on TRISTAN physics at high luminosities, Tsukuba (Japan), 24-26 Nov 1993). In *Proceedings of the 2nd workshop on TRISTAN physics at high luminosities.* 451p. Order Number DE94785274. Source: OSTI; NTIS; INIS.

We report a study of single photon events produced in e^+e^- collisions at $\sqrt{s}$=59GeV with the TOPAZ detector at TRISTAN. 4 single photon candidates remained after event selection, which should be compared with the expected 2.5 signal events from $\gamma\nu\nu$-bar and 1.4 background events. The result is consistent with the standard model prediction. (author).

2176 (LAL–93-38) **Higgs boson search at a 500 GeV e^+e^- collider.** Janot, P. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Jul 1993. 27p. (CONF-9304232–: 2. international workshop on physics and experiments with linear e+e- colliders, Waikoloa, KO (United States), 26-3 Apr 1993). Order Number DE95607157. Source: OSTI; NTIS (US Sales Only); INIS.

The search for Higgs bosons at a 500 GeV e^+e^- linear collider is summarized. It is shown that the potential for the discovery and identification of the Standard Model Higgs boson is complementary to that of the future hadron colliders and that, in contrast to these colliders, the parameter space of the Minimal Supersymmetric extension of the Standard Model (the MSSM) can be totally explored with a modest integrated luminosity. After one year of operation, corresponding to an integrated luminosity of 10 fb^{-1}, all the Higgs bosons of the MSSM can be discovered. Above the kinematic limit only one Higgs boson is accessible to the discovery, but the precise measurement of its decay branching ratios extends to higher values of m_A the region where the MSSM can be identified and disentangled from the Standard Model. (author). 27 refs., 21 figs.

2177 (LAPP-EXP–94-03) **Electroweak interference at LEP: Measurements of $A_{FB}{}^b$ and $A_{FB}{}^c$ at LEP.** Rosier-Lees, S. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Mar 1994. 18p. (CONF-9309292–: Advanced study conference on heavy flavours, Pavia (Italy), 3-7 Sep 1993). Order Number DE95607189. Source: OSTI; NTIS (US Sales Only); INIS.

The most recent measurements of the Forward Backward asymmetries (A_{FB}) of heavy quarks performed by the four LEP experiments are described. After taking care in the evaluation of common systematic errors, all results are combined to obtain: $A_{FB}{}^b$=9.4±0.6%, $A_{FB}{}^c$=6.1±1.5%. In the Standard Model frame work this leads to a value of the weak mixing of $\sin^2\Theta_w{}^{eff}$=0.2323±0.0011. This method provides the most precise measurement of $\sin^2\Theta_w{}^{eff}$ obtained so far. (author). 19 refs., 7 figs., 9 tabs.

2178 (LBL–36033) **Dilepton production from p-p to Ca-Ca at the Bevalac.** Matis, H.S. DLS Collaboration. Lawrence Berkeley Lab., CA (United States). Jun 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098 ; FG03-88ER40424 ; FG02-88ER40413 ; FG05-88ER40445. (CONF-940509–7: Conference on nucleus-nucleus collisions, Catania (Italy), 30 May - 4 jun 1994). Order Number DE95002341. Source: OSTI; NTIS; INIS; GPO Dep.

The DLS collaboration has recently completed a high statistics study of dilepton production at the Bevalac. In particular, we have measured dielectrons (e^+e^-) from p-p and p-d collisions to understand the basic dilepton production mechanisms in the energy range from 1.05–4.9 GeV. These data can be used to determine the basic processes which contribute to nucleon-nucleon dilepton production such as hadronic bremsstrahlung, vector meson processes, and hadronic Dalitz decay. The data show that a simple elastic bremsstrahlung calculation is insufficient to explain the data. Theoretical models are compared with the data. A new high statistics study of Ca-Ca at 1.05 A·GeV has been made to study the collectivity of A-A collisions.

2179 (MPI-PhE–94-07) **Measurement of the structure function F_2 of the proton in deep inelastic e-p scattering with the H1 detector at the HERA storage ring.** Wellisch, J.P. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut; Technische Univ. Muenchen, Garching (Germany). Fakultaet fuer Physik. Feb 1994. 173p. (In German). Order Number DE95716210. Source: OSTI; NTIS (US Sales Only); INIS.

This thesis presents the measurement of the structure function F_2 of the proton with the H1 detector at 10 $GeV^2<Q^2<100$ GeV^2 and $10^{-4}<x<10^{-2}$. The analysis contains the data of the first year of the HERA operation. The applied integrated luminosity amounts to 22.5 nb^{-1}. Contrarily to earlier experiments of the deep inelastic scattering it is at H1 possible to apply also the hadronic final state for the reconstruction of the event kinematics. In this thesis ten methods for the reconstruction of the event kinematics are indicated and studied in the region $Q^2<1000$ GeV^2 in detailed detector simulation on resolution, systematic effects, measurable kinematical range and sensitivity to radiation of photons from the electron. For H1 as most advantageous methods for the reconstruction of the event kinematics on the one hand the exclusive application of the electron information and on the other hand the combination of the measurement of the momentum transfer from energy and direction of the scattered electron with the measurement of the relative energy transfer y from the scattering of electron and quark have been proved. Thereby a new, for the range of small momentum transfers especially suited method, for the reconstruction of the scattering angle of the quark was indicated. A significant increasement of the structure function F_2 of the proton at small x. At large x the continuation to the results found in earlier measurements is continuous. At fixed x the structure function increases slowly in agreement with the predictions of QCD with increasing momentum transfer.

2180 (MPI-PhE–94-16) **A precision measurement of the branching ratio $\Gamma_{bantlb}/\Gamma_{had}$ in the e^+e^- annihilation on the Z^0 resonance.** Frank, M. Max-Planck-Institut fuer Physik, Muenchen (Germany). Werner-Heisenberg-Institut; Technische Univ. Muenchen, Garching (Germany). Fakultaet fuer Physik. Jul 1994. 175p. (In German). Order Number DE95715048. Source: OSTI; NTIS (US Sales Only); INIS.

In this thesis the decay of the neutral gauge bosons into bottom quarks was studied. Bottom quarks from the reaction $e^+e^-\rightarrow Z^0/\gamma\rightarrow b$ anti b possess a finite decay length. By the application of a silicon strip detector very close to the interaction point charged tracks in the ALEPH detector can be measured very precisely. The precise measurement of the impact parameter of charged tracks permits the discrimination between a track from the primay vertes and a track, which originates from a secondary vertex. For each track the probability is calculated, whether it originates from a secondary decay (for instance of a bottom hadron) or from the primary vertex. By the combination of the track probabilities in the single event halfs to a hemisphere probability decays of the bottom quarks with high purity can be very efficiently selected. The enrichment of the selected events allows the very precise measurement of $\Gamma_{Z^0\rightarrow bantlb}/\Gamma_{Z^0\rightarrow hadrons}$: $\Gamma_{Z^0\rightarrow bantlb}/\Gamma_{Z^0\rightarrow hadrons}$=0.2187±$0.0026_{sys.}$±$0.0022_{stat.}$. If the validity of the standard model is presupposed, so from this measurement an upper limit for the mass of the top quark can be calculated: $m_{top}<187$ GeV. This bound is related to a confidence level of 66%. From the comparison of the predictions for $\Gamma_{Z^0\rightarrow bantlb}/\Gamma_{Z^0\rightarrow hadrons}$ with the measured values extended technicolor models can be excluded with high probability.

2181 (SLAC-PUB–6586) **A preliminary, precise measurement of the average B hadron lifetime.** SLD Collaboration. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Jul 1994. 10p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Istituto Nazionale di Fisica Nucleare, Rome (Italy);Science and Engineering Research Council, Swindon (United Kingdom);US-Japan High Energy Phys DOE Contract FG02-91ER40676 ; FG03-92ER40701 ; FG03-91ER40618 ; FG03-92ER40689 ; FG03-93ER40788 ; FG02-91ER40672 ; FG02-91ER406Grant PHY-91-13428; Grant PHY-88-17930; Grant PHY-88-19316; Gran (CONF-940722–28: 27. international conference on high energy physics, Glasgow (United Kingdom), 21-27 Jul 1994). Order Number DE95001848. Source: OSTI; NTIS; INIS; GPO Dep.

The average B hadron lifetime was measured using data collected with the SLD detector at the SLC in 1993. From a sample of ~50,000 Z^0 events, a sample enriched in $Z^0\rightarrow b\bar{b}$ was selected by applying an impact parameter tag. The lifetime was extracted from the decay length distribution of inclusive vertices reconstructed in three dimensions. A binned maximum likelihood method yielded an average B hadron lifetime of τ_B = 1.577 ± 0.032(stat.) ± 0.046(syst.) ps.

2182 (SLAC-PUB-6665) **Polarization of charmonium in πN collisions.** Tang, Wai-Keung. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Sep 1994. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00515. (CONF-9409103-2: International symposia on high energy spin physics and polarization phenomena in nuclear physics, Bloomington, IN (United States), 15-22 Sep 1994). Order Number DE95002783. Source: OSTI; NTIS; INIS; GPO Dep.

Measurements of the polarization of J/ψ produced in pion-nucleus collisions are in disagreement with leading twist QCD prediction were J/ψ is observed to have negligible polarization whereas theory predicts substantial polarization. We argue that this discrepancy cannot be due to poorly known structure functions nor the relative production rates of J/ψ and X_J. The disagreement between theory and experiment suggests important higher twist corrections, as has earlier been surmised from the anomalous non-factorized nuclear A-dependence of the J/ψ cross section.

2183 (UM-P-93/51) **Study of the simplest realistic Higgs sector in quark-lepton symmetric models.** Levin, Y.; Volkas, R.R. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 25p. (OZ-93/11.). Order Number DE95607159. Source: OSTI; NTIS (US Sales Only); INIS.

A discrete symmetry between quarks and (generalized) leptons can exist in nature, and its spontaneous symmetry breaking scale can be as low as a few TeV. Such discrete symmetry also has interesting implications for how electroweak symmetry is spontaneously broken, because the simplest version of the theory requires two electroweak Higgs doublets rather than one in order to provide acceptable values for quark and lepton masses. The effective theory generated at electroweak-scale energies is thus a particular type of two-Higgs-doublet model. We point out in this paper that the broken discrete symmetry imposes very interesting constraints on the form of the Yukawa couplings between physical Higgs bosons and quarks and leptons. In particular, we find that the flavour-changing neutral Higgs couplings to down-sector quarks are proportional to the neutrino Dirac mass matrix. If neutrinos are Dirac particles, then the severe experimental upper bounds on their mass values renders tree-level neutral flavour-changing Higgs effects on down-quark systems like K^0 - K^0 - bar negligibly small. 15 refs.

2184 (UM-P-93/58) **Anomalous WWZ couplings and $K_L \rightarrow \mu^+ \mu^-$.** He, Xiaogang. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 9p. Sponsored by Australian Research Council, Canberra, ACT (Australia). (OZ-93/13.). Order Number DE95607190. Source: OSTI; NTIS (US Sales Only); INIS.

The author analysed contributions to $K_L \rightarrow \mu^+\mu^-$ from anomalous WWZ interactions. There are, in general, seven anomalous couplings. Among the seven anomalous couplings, only two of them contribute significantly. The others are suppressed by factors like m^2_s/M^2_W, m^2_d/M^2_W, or M^2_K/M^2_W. Using the experimental data on $K_L \rightarrow \mu^+\mu^-$, it is possible to obtain strong bounds on the two anomalous couplings. 10 refs., 6 tabs.

6624 Properties of Specific Particles and Resonances

Refer also to citation(s) 2144, 2149, 2152, 2154, 2163, 2166, 2176, 2180, 2182, 2225, 2237, 2269

2185 (BONN-IB-94-03) **Upper limit determination for the τneutrino mass with OPAL detector.** Posthaus, A. Bonn Univ. (Germany). Physikalisches Inst.; Bonn Univ. (Germany). Mathematisch-Naturwissenschaftliche Fakultaet. 2 Feb 1994. 71p. (In German). Order Number DE95711495. Source: OSTI; NTIS (US Sales Only); INIS.

An upper limit on the ν_τ-mass is measured indirectly through the kinematic reconstruction of the rare decay $\rho \rightarrow 5\pi^{\pm}(\pi^0)\nu_\tau$ which is particularily sensitive to the neutrino mass. The limit is extracted by a new two-dimensional method. The invariant mass and energy spectra of the data are compared to theoretical distributions under different neutrino mass hypotheses. From 5 selected events an upper limit of 74 MeV at 95% confidence level is obtained. (orig.)

2186 (DESY-93-123C, pp. 87-105) **Radiative corrections in the MSSM Higgs sector: masses and fermionic decays.** Dabelstein, A. (Inst. fuer Theoretische Physik, Univ. Karlsruhe (Germany)); Hollik, W. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327-: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

The structure of the Higgs sector in the minimal supersymmetric standard model is reviewed at the 1-loop level. We give the results of a complete 1-loop calculation for the mass spectrum and the fermionic decay widths $\Gamma(h^0, H^0, A^0 \rightarrow f \text{ anti } f)$ of the neutral MSSM Higgs bosons and discuss the quality of simpler Born-like approximations. (orig.)

2187 (DESY-93-123C, pp. 107-113) **Detecting the non-minimal supersymmetric Higgs boson at the NLC.** Hempfling, R. (Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327-: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We discuss the prospectives of discovering a non-minimal supersymmetric Higgs boson at the next linear collider (NLC). The analysis includes the leading logarithmic radiative corrections. (orig.)

2188 (DESY-93-123C, pp. 397-410) **Bound on the lightest Higgs mass in the minimal ηmodel at one loop.** Comelli, D. (Dept. of Theoretical Physics, Univ. Trieste (Italy)). Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327-: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

A one loop bound to the lightest Higgs mass of the sypersymmetric E_6 based η model has been calculated. Under the assumption that the theory remains perturbative up to the 10^{16} GeV scale, the conservative bound puts a limit that decreases with the top mass for $M_t \leq 2M_W$ and varies from $\approx$160 GeV to $\approx$145 GeV when $90 \leq M_t \leq 200$ GeV. (orig.)

2189 (DESY-93-123C, pp. 491-505) **Search for neutral particles in nonminimal SUSY model.** Kim, B.R. (3. Phys. Inst. A, RWTH Aachen (Germany)); Oh, S.K.; Stephan, A. Deutsches Elektronen-Synchrotron (DESY), Hamburg (Germany). Dec 1993. (CONF-9211327-: Meeting on e+ e- collisions at 500 GeV: the physics potential, Munich (Germany), 20 Nov 1992). In *e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings.* 611p. Order Number DE95711481. Source: OSTI; NTIS (US Sales Only); INIS.

We show that in NMSSM there are parameter regions where at least both one neutralino and one neutral scalar Higgs boson are very light without contradicting to the present experimental data. We also give a simple relation for the upper bound on the mass of the lightest scalar Higgs boson. (orig.)

2190 (DOE/ER/40439-T2) **Nuclear research with the electromagnetic probe: Final progress report.** Meziani, Z.E. Temple Univ., Philadelphia, PA (United States). Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-88ER40439. Order Number DE95001812. Source: OSTI; NTIS; INIS; GPO Dep.

This is the final report on the research carried at Stanford University under contract DE-FG03-88ER40439. All the work accomplished under this grant is reported in the publications listed as part of the Principal Investigator bibliography at the end of this report. In the last few years our research was directed at some of the forefront questions in nuclear physics. We investigated the nuclear medium effects on the intrinsic properties of bound nucleons, specifically the ectromagnetic form factors. For these studies we performed a number of specialized electron scattering experiments

with specific sensitivity to nuclear medium effects. At the next level of structure, elementary constituents of matter are quarks and gluons. Defining the energy regime where the quark-gluon description of nuclear systems becomes more relevant than the nucleon-meson description is of great importance in thoroughly understanding the nuclear structure. To explore this transition region, we studied the scaling region in the disintegration of the deuteron, the simplest nuclear system with high energy photons. Finally we focused on the investigation of the nucleon internal spin structure along with the test of the Bjoerken sum rule a fundamental sum rule of QCD.

2191 (FNAL/C–94/314-E) **Evidence for $t\bar{t}$ production at the Tevatron: Statistical significance and cross section.** Koningsberg, J. (Harvard University, Cambridge, MA (United States). Dept. of Physics). CDF Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940816–46: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002524. Source: OSTI; NTIS; INIS; GPO Dep.

We summarize here the results of the "counting experiments" by the CDF Collaboration in the search of $t\bar{t}$ production in $p\bar{p}$ collisions at $\sqrt{s}$ = 1800 TeV at the Tevatron. We analyze their statistical significance by calculating the probability that the observed excess is a fluctuation of the expected backgrounds, and assuming the excess is from top events, extract a measurement of the $t\bar{t}$ production cross-section.

2192 (IC–94/163) **Neutrino mass and oscillation angle phenomena within the asymmetric left-right models.** Boyarkin, O. (International Centre for Theoretical Physics, Trieste (Italy)); Rein, D. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 21p. Order Number DE95607201. Source: OSTI; NTIS (US Sales Only); INIS.

The light and heavy Majorana neutrinos which appear naturally in $SU(2)_L \times SU(2)_R \times U(1)_{B-L}$ model are investigated. The exact solutions are presented for the system of two neutrinos with multipole moments propagating through magnetic and matter fields. The cross section of the reaction $e^-e^- \rightarrow W^-_k W^-_n$ calculated and its dependence on the mass of the right-handed neutrino and the oscillation angle is investigated. The process $e^+e^- \rightarrow W^+_k W^-_n$ is also included in our analysis. (author). 26 refs, 9 figs.

2193 (IPNO-TH–91-9l) **$\pi\pi$ and KK-bar channel coupling. Pt. 2: The f_0(975) meson and KK-bar threshold effects.** Cannata, F. (Istituto Nazionale di Fisica Nucleare, Bologna (Italy)); Dedonder, J.P.; Lesniak, L. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 6 Dec 1991. 30p. Order Number DE95607199. Source: OSTI; NTIS (US Sales Only); INIS.

A separable potential formalism is used to study KK-bar threshold effects. In addition to the $\pi\pi$ and KK-bar channels, a channel with heavy constituents is introduced to simulate the role of additional channels in building up the f_0(975) meson, assuming no direct interaction in the KK-bar channel. As a consequence, the coupling between the exotic channel and the KK-bar channel is rather large. A method of reducing the three-channel problem to an effective two-channel one is shown. Various physical observables, like the decay branching ratio and the KK-bar scattering length, are discussed in this effective two-channel framework. (K.A.) 20 refs., 5 figs., 3 tabs.

2194 (IPNO-TH–93-17) **A possible experimental determination of m_s/m-circumflex from $K_{\mu 4}$ decays.** Knecht, M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Sazdjian, H.; Stern, J.; Fuchs, N.H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1993. 11p. Order Number DE95607210. Source: OSTI; NTIS (US Sales Only); INIS.

$K\pi$ scattering and $K_{\mu 4}$ decays are studied at leading order of improved chiral perturbation theory. It is shown that high precision $K_{\mu 4}$ experiments at, e.g., DAΦNE accelerator, should allow for a direct measurement of the quark mass ratio m_s/m-circumflex. (authors). 12 refs., 2 figs.

2195 (IPNO-TH–93-38) **Light quark masses from exclusive tau decays: An experimental proposal.** Stern, J.; Knecht, M.; Fuchs, N.H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 25p. (CONF-9306276–: 3. international workshop on a tau-charm factory, Marbella (Spain), 1-6 Jun 1993). Order Number DE95607211. Source: OSTI; NTIS (US Sales Only); INIS.

A method of indirect measurement of the light quark running mass m-circumflex = $(m_d + m_u)/2$ is elaborated in detail. It is based on measuring 1%-level azimuthal angular asymmetries in the decay $\tau \rightarrow \nu_\tau + 3\pi$. The latter are then used in QCD sum rules to obtain experimental lower bounds for m-circumflex. For a sample of $2.5 * 10^5$ $\tau \rightarrow \nu_\tau + 3\pi$ decays free of background, the resulting statistical error in the bound for m-circumflex is estimated to be 1 MeV, i.e., comparable to the systematic error due to the use of QCD sum rules. (authors) 22 refs., 7 figs., 1 tab.

2196 (LAL–93-10) **Production and lifetime measurements for B_s^0 with the LEP DELPHI detector.** Stocchi, A. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire; Paris-11 Univ., 91 - Orsay (France). 10 May 1993. 203p. (In French). Order Number DE95607193. Source: OSTI; NTIS (US Sales Only); INIS.

Using data registered in 1991 by the DELPHI detector at LEP a signal of B_s^0 meson has been obtained. Two different final states have been considered and their contaminations from non -B_s^0 sources have been evaluated. The $D_s^{\pm} l^{-+}$ final state has a purity in B_s^0 of the order of 90%, once the lepton is required to be at large P_T relative to the jet axis. The Φl^{-+} final state has a purity of the order of 60%. From these data, the probability that a B_s^0 meson is produced during the hadronization of a b quark has been measured: $f_s^{\omega} = 0.17 \pm 0.07 \pm 0.06$. The B_s^0 lifetime has been also determined to be: $\tau_{B_{s0}} = 1.15 \pm 0.53$ ps. A preliminary analysis of $D_s^{\pm} l^{-+}$ events from data registered in 1992 gives a more accurate value for the B_s^0 lifetime when combined with the previous measurement: $\tau_{B_{s0}} = 1.2 \pm 0.4$ ps. (author). 679 refs., 75 figs., 25 tabs.

2197 (LAPP-A–450/93) **The laboratory and astrophysical constraints on the neutrino charge radius.** Salati, P. Grenoble-1 Univ., 74 - Annecy (France). Lab. de Physique des Particules Elementaires. Dec 1993. [36p.] Order Number DE95607202. Source: OSTI; NTIS (US Sales Only); INIS.

If the properties of neutrino magnetic moments have been extensively studied, the consequences of a non-vanishing charge radius have drawn little attention so far. The laboratory bounds are reviewed. They are fairly comparable to the constraints set by the cooling of red giant stars. The relevance of anapole neutrinos to the explosion mechanism of massive stars is also discussed. As a matter of fact, if neutrinos have an anomalous charge radius, they can drag some fraction of the gravitational energy released during the collapse of a compact object. As they transfer it to the envelope of the supernova, neutrinos revitalize the stalled shock wave. (author). 42 refs., 9 figs.

2198 (LYCEN–9423) **Single spin asymmetry in inclusive pion production, Collins effect and the string model.** Artru, X. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Czyzewski, J.; Yabuki, H. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. May 1994. 18p. (TPJU–12/94.). Order Number DE95607200. Source: OSTI; NTIS (US Sales Only); INIS.

We calculate the single spin asymmetry in the inclusive pion production in proton-proton collisions. We generate the asymmetry at the level of fragmentation function (Collins effect) by the Lund coloured string mechanism. We compare our results with the Fermilab E704 data from p ↑p collisions at 200 GeV. We show that the transversely polarized quark densities at high Bjorken x strongly differ from these predicted by the SU(6) proton wave function. (authors). 18 refs., 7 figs.

2199 (SLAC-PUB–6595) **Measurement of the average lifetime of B hadrons at SLD.** Punkar, G. Stanford Linear Accelerator Center, Menlo Park, CA (United States). Sep 1994. 4p. Sponsored by USDOE, Washington, DC (United States);Science and Engineering Research Council, Swindon (United Kingdom);National Science Foundation, Washington, DC (United States);Japan Atomic Energy Research Inst., Tokyo (Japan);Istituto Nazionale di Fisic DOE Contract FG02-91ER40676 ; FG03-92ER40701 ; FG03-91ER40618 ; FG03-92ER40689 ; FG03-93ER40788 ; FG02-91ER40672 ; FG02-91ER406Grant PHY-91-13428; Grant

PHY-89-21320; Grant PHY-92-04239; Gran (CONF-940816–37: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002121. Source: OSTI; NTIS; INIS; GPO Dep.

The authors present preliminary measurements of the average B hadron lifetime using a sample of 50,000 Z^0 events collected by SLD at the SLC in 1993. Their first technique uses the impact parameter of tracks in jets opposite tagged b jets. They obtain $\tau_B(\delta)$ = 1.617 ± 0.048 ± 0.086 ps, and $\tau_B(\Sigma\delta)$ = 1.627 ± 0.054 ± 0.132 ps from single and summed impact parameter distributions. The second technique uses inclusive vertices reconstructed in three dimensions. From the decay length distribution, they extract τ_B = 1.577 ± 0.032 ± 0.046 ps.

2200 (UM-P–93/42) **Can the electric charges of elementary particles change with time?.** Ignatiev, A. Yu.; Joshi, G.C. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 9p. Sponsored by Australian Research Council, Canberra, ACT (Australia). Order Number DE95607194. Source: OSTI; NTIS (US Sales Only); INIS.

This paper presents the limits on possible time variation of the electric charges of quarks and leptons at the time of primordial nucleosynthesis within a model with de quantized electric charges which allows for the case of charged neutrino and neutron. 17 refs.

6630 Nuclear Physics

Refer also to citation(s) 2571

2201 (ANL–94/31) **Physics Division annual report, April 1, 1993–March 31, 1994.** Thayer, K.J. (ed.); Henning, W.F. Argonne National Lab., IL (United States). Aug 1994. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95003098. Source: OSTI; NTIS; INIS; GPO Dep.

This is the Argonne National Laboratory Physics Division Annual Report for the period April 1, 1993 to March 31, 1994. It summarizes work done in a number of different fields, both on site, and at other facilities. Chapters describe heavy ion nuclear physics research, operation and development of the ATLAS accelerator, medium-energy nuclear physics research, theoretical physics, and atomic and molecular physics research.

2202 (DOE/ER/40505–T1) **Assessment of the current status of basic nuclear data compilations.** Riemer, R.L. National Academy of Sciences - National Research Council, Washington, DC (United States). 1992. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-89ER40505. Order Number DE95001764. Source: OSTI; NTIS; INIS; GPO Dep.

The Panel on Basic Nuclear Data Compilations believes that it is important to provide the user with an evaluated nuclear database of the highest quality, dependability, and currency. It is also important that the evaluated nuclear data are easily accessible to the user. In the past the panel concentrated its concern on the cycle time for the publication of A-chain evaluations. However, the panel now recognizes that publication cycle time is no longer the appropriate goal. Sometime in the future, publication of the evaluated A-chains will evolve from the present hard-copy Nuclear Data Sheets on library shelves to purely electronic publication, with the advent of universal access to terminals and the nuclear databases. Therefore, the literature cut-off date in the Evaluated Nuclear Structure Data File (ENSDF) is rapidly becoming the only important measure of the currency of an evaluated A-chain. Also, it has become exceedingly important to ensure that access to the databases is as user-friendly as possible and to enable electronic publication of the evaluated data files. Considerable progress has been made in these areas: use of the on-line systems has almost doubled in the past year, and there has been initial development of tools for electronic evaluation, publication, and dissemination. Currently, the nuclear data effort is in transition between the traditional and future methods of dissemination of the evaluated data. Also, many of the factors that adversely affect the publication cycle time simultaneously affect the currency of the evaluated nuclear database. Therefore, the panel continues to examine factors that can influence cycle time: the number of evaluators, the frequency with which an evaluation can be updated, the review of the evaluation, and the production of the evaluation, which currently exists as a hard-copy issue of Nuclear Data Sheets.

6631 Nuclear Structure

Refer also to citation(s) 2002, 2227, 2258, 2260, 2363

2203 (BNL–60785) **Universal correlations of collective observables: Empirical phenomenology and model interpretations.** Casten, R.F. (Brookhaven National Lab., Upton, NY (United States)); Zamfir, N.V.; Brenner, D.S. Brookhaven National Lab., Upton, NY (United States); Clark Univ., Worcester, MA (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; FG02-88ER40417. (CONF-9403135–2: International symposium on frontiers of nuclear structure physics, Tokyo (Japan), 2-5 Mar 1994). Order Number DE95002173. Source: OSTI; NTIS; INIS; GPO Dep.

Universal and simple correlations of collective observables, with each other and with structural parameters such as N_pN_n, are discussed along with their implications for the evolution of nuclear structure.

2204 (BNL–60796) **Evidence for pervasive phonon structure of nuclear excitations.** Casten, R.F. (Brookhaven National Lab., Upton, NY (United States)); Zamfir, N.V. Brookhaven National Lab., Upton, NY (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; FG02-88ER40417. (CONF-9405247–1: Harmony of physics conference, Philadelphia, PA (United States), 8-9 May 1994). Order Number DE95002171. Source: OSTI; NTIS; INIS; GPO Dep.

Recent work suggests that phonon and intact multiphonon excitations are pervasive in nuclei whose structures run the gamut of collective types. Some of this evidence for a nearly universal phonon description of low energy nuclear spectral will be summarized.

2205 (BNL–60807) **Robust predictions of the interacting boson model.** Casten, R.F. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States). [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940697–4: International conference on perspectives for the interacting Boson model on the occasion of its 20th anniversary, Padua (Italy), 13-17 Jun 1994). Order Number DE95002179. Source: OSTI; NTIS; INIS; GPO Dep.

While most recognized for its symmetries and algebraic structure, the IBA model has other less-well-known but equally intrinsic properties which give unavoidable, parameter-free predictions. These predictions concern central aspects of low-energy nuclear collective structure. This paper outlines these "robust" predictions and compares them with the data.

2206 (BNL–60808) **E1 and E3 transition rates in the sdf-IBA.** Zamfir, N.V. (Brookhaven National Lab., Upton, NY (United States)). Brookhaven National Lab., Upton, NY (United States); Clark Univ., Worcester, MA (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016 ; FG02-88ER40417. (CONF-940697–3: International conference on perspectives for the interacting Boson model on the occasion of its 20th anniversary, Padua (Italy), 13-17 Jun 1994). Order Number DE95002175. Source: OSTI; NTIS; INIS; GPO Dep.

The E1 and E3 transition operators in the sdf-IBA model are discussed. An effective E1 operator containing one- and two-body terms explains very well the E1 data in transitional and rotational nuclei. The E1 parameters for rotational nuclei are obtained by imposing a constraint on the IBA model namely, the validity of Alaga rules for "pure K" states. The systematic behavior of the octupole strength is well reproduced using a one-body octupole operator. The anomalously large fragmentation of the low-energy octupole strength in non-rotational nuclei is shown to be a signature of the O(6) dynamical symmetry.

2207 (GSI–94-56(prepr.)) **Fermion damping rate in a hot medium.** Henning, P.A. (Technische Hochschule Darmstadt (Germany). Inst. fuer Kernphysik); Sollacher, R.; Weigert, H. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 27p. (HEP-PH–9409280). Order Number DE95715043. Source: OSTI; NTIS (US Sales Only); INIS.

In hot systems, fermions coupled to a massless boson field acquire a finite lifetime. This nonzero spectral width is calculated self-consistently for the case of scalar, vector and pseudoscalar coupling: The one-loop Fock diagram is evaluated with an effective propagator. We find solutions that are analytical in the coupling constant, but not analytical in the temperature parameter around T=0. (orig.)

2208 (INIS-mf–14386, pp. WP33) **The bond structure of closed shells in condensed nuclear matter.** Norman, P. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. ALPHA PARTICLES/chemical bonds; MAGIC NUCLEI/alpha particles; MAGIC NUCLEI/shell models; BINDING ENERGY; BOND LENGTHS; CALCIUM 40; ENERGY LEVELS; HELIUM 4; NICKEL 56; NUCLEAR MATTER; NUCLEAR STRUCTURE; NUCLEOSYNTHESIS; OXYGEN 16

2209 (IPNO-DRE–93-22) **The giant dipole resonance built on highly excited states: Results of the MEDEA experiment.** Suomijaervi, T. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Le Faou, J.H.; Blumenfeld, Y.; Piattelli, P.; Agodi, C.; Alba, R.; Alamanos, N.; Auger, F.; Chomaz, Ph. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 14p. (CONF-930867–: Gull Lake nuclear physics conference on giant resonances, Gull Lake, MI (United States), 17-21 Aug 1993). Order Number DE95607216. Source: OSTI; NTIS (US Sales Only); INIS.

Gamma-rays, light charged particles and evaporation residues emitted from hot nuclei formed in the $^{36}Ar+^{90}Zr$ reaction at 27 MeV/u have been measured with a nearly 4π barium fluoride multidetector. It is shown that hot Sn-like nuclei with a range of excitation energies between 300 and 600 MeV are produced. The γ-ray yield from the decay of the Giant Dipole Resonance in these nuclei is shown to remain constant over this excitation energy range. The measured γ-ray spectra are compared with statistical calculations encompassing several recent theoretical models for the quenching of gamma-ray emission from the dipole resonance at very high temperatures. (authors). 32 refs., 5 figs., 1 tab.

2210 (IPNO-DRE–93-23) **Statistical and direct decay of high-lying single-particle excitations.** Gales, S. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 14p. Order Number DE95607217. Source: OSTI; NTIS (US Sales Only); INIS.

Transfer reactions induced by hadronic probes at intermediate energies have revealed a rich spectrum of high-lying excitations embedded in the nuclear continuum. The investigation of their decay properties is believed to be a severe test of their microscopic structure as predicted by microscopic nuclear models. In addition the degree of damping of these simple modes in the nuclear continuum can be obtained by means of the measured particle (n,p) decay branching ratios. The neutron and proton decay studies of high-lying single-particle states in heavy nuclei are presented. (author). 13 refs., 9 figs.

2211 (IPNO-DRE–93-24) **Multiphonon excitations in nuclei built with giant resonances.** Frascaria, N. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 14p. (CONF-930867–: Gull Lake nuclear physics conference on giant resonances, Gull Lake, MI (United States), 17-21 Aug 1993). Order Number DE95607218. Source: OSTI; NTIS (US Sales Only); INIS.

The concept of multiphonon excitation is introduced and the various methods to excite these states in nuclei are presented and discussed. An example given by the new results obtained in the $^{40}Ca+^{40}Ca$ reaction at intermediate energy is extensively discussed. An original method to sign the presence of isoscalar multiphonon strength in ^{40}Ca through its specific proton decay pattern is presented. (author) 32 refs., 9 figs.

2212 (IPNO-DRE–94-03) **Towards limiting temperatures in nuclei: The behaviour of collective motion.** Le Faou, J.H. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Suomijaervi, T.; Blumenfeld, Y.; Piattelli, P.; Agodi, C.; Coniglione, R.; Alamanos, N.; Auger, F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 4 Jan 1994. [17p.] Order Number DE95607306. Source: OSTI; NTIS (US Sales Only); INIS.

Gamma-rays emitted from hot nuclei with mass around 115 and excitation energies between 350 and 550 MeV, formed in the $^{36}Ar+^{90}Zr$ reaction at 27 MeV/u, have been measured. The γ-ray yield from the decay of the giant dipole resonance in these nuclei remains constant over the excitation energy range studied. This quenching of the γ multiplicity cannot be explained by a continuous increase with temperature of the width of the resonance. Better agreement with the data is obtained by assuming a cut-off of γ-emission from the resonance above an excitation energy of 250 MeV. The existing data do not show entrance channel effects. (authors). 21 refs., 3 figs., 1 tab.

2213 (IPNO-TH–93-07) **Many-body methods at finite temperature.** Vautherin, D. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jan 1993. 50p. (CONF-9302201–: J.A. Swieca summer school, Sao Paulo (Brazil), 1-6 Feb 1993). Order Number DE95607307. Source: OSTI; NTIS (US Sales Only); INIS.

The approximation methods relevant to describe many-fermion systems at finite temperatures are reviewed. The grand canonical formalism is outlined for independent fermions, and its applicability to the case of finite nuclei is discussed for which fluctuations arising from the small number of particles involved are expected to be sizeable. Derivation of the mean field equations is presented based on the variational method. Perturbation expansions of partition functions are discussed. A particularly important subseries containing the so called ring diagrams whose summation leads to the random phase approximation (RPA) is studied. An application to the physics of giant resonances in hot nuclei is described. (K.A.) 64 refs., 3 figs.

2214 (IPNO-TH–93-14) **Hadronic physics with multi-GeV electrons.** Mathiot, J.F. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Apr 1993. 20p. (CONF-930319–: International conference on nuclear and particle physics, Glasgow (United Kingdom), 30 Mar - 1 apr 1993). Order Number DE95607308. Source: OSTI; NTIS (US Sales Only); INIS.

The contacts between nuclear and particle physics have become closer and closer these last ten years, in particular with the development of what is now called hadronic physics. It is shown why the first low lying hadrons, nucleons and pions, are now identified as the relevant physical degrees of freedom in nuclei. As a direct consequence of this description it is shown how the nucleon and pion properties can be modified in the nuclear medium. The new directions that have emerged the last few years to study the microscopic structure of hadrons are indicated, in particular it is shown how the nucleus can be used to unravel the quark dynamics inside hadrons. (author). 25 refs., 18 figs., 1 tab.

2215 (IPNO-TH–93-66) **Superdeformed rotational bands in the Mercury region: A cranked Skyrme-Hartree-Fock-Bogoliubov study.** Gall, B. (Paris-11 Univ., 91 - Orsay (France). Centre de Spectrometrie Nucleaire et de Spectrometrie de Masse); Bonche, P.; Dobaczewski, J.; Heenen, P.H.; Flocard, H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 17 Dec 1993. [40p.] Order Number DE95607309. Source: OSTI; NTIS (US Sales Only); INIS.

A study of rotational properties of the ground superdeformed bands in ^{190}Hg, ^{192}Hg, ^{194}Hg, and ^{194}Pb is presented. The cranked Hartree-Fock-Bogolyubov method is used with the SkM* parametrization of the Skyrme force in the particle-hole channel and a seniority interaction in the pairing channel. An approximate particle number projection is performed by means of the Lipkin-Nogami prescription. The proton and neutron quasiparticle rhouthians are analyzed in connection with the present information on about thirty presently observed superdeformed bands in nuclei close neighbours of ^{192}Hg. (authors). 53 refs., 14 figs.

2216 (IPNO-TH–94-09) **Realistic microscopic level densities for spherical nuclei.** Cerf, N. Paris-11 Univ., 91 - Orsay

(France). Inst. de Physique Nucleaire. Jan 1994. [29p.] Order Number DE95607220. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, C (US).

Nuclear level densities play an important role in nuclear reactions such as the formation of the compound nucleus. A microscopic calculation of the level density is developed based on a combinatorial evaluation from a realistic single-particle level scheme. This calculation makes use of a fast Monte Carlo algorithm allowing to consider large shell model spaces which could not be treated previously in combinatorial approaches. Since our model relies on a microscopic basis, it can be applied to exotic nuclei with more confidence than the commonly used semi-phenomenological formulae. An exhaustive comparison of our predicted neutron s-wave resonance spacings with experimental data for a wide range of nuclei is presented. (author). 39 refs., 11 figs., 1 tab.

2217 (ITP–94-2) **The Realization of the Resonating Group Method Algebraic Version for Three-Cluster Systems.** Filippov, G.F.; Nesterov, A.V.; Rybkin, I.Yu.; Korennov, S.V. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 29p. Order Number DE95607310. Source: OSTI; NTIS (US Sales Only); INIS.

The harmonic oscillator basis for the description of three-cluster systems is constructed in the Fock-Bargmann representation. The transformation of basis functions accompanying the nucleon permutation operation is found. The problem of constructing the allowed states is solved. An algorithm of calculation of the Hamiltonian matrix elements in the basis of allowed states is developed.

2218 (ITP–94-5) **Nuclear matter equation of state with effects of excluded volume.** Anchishkin, D.; Suhonen, E. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki; Oulu Univ. (Finland). Dept. of Theoretical Physics. 1994. 21p. Order Number DE95607221. Source: OSTI; NTIS (US Sales Only); INIS.

Phenomenological mean field models of nuclear interactions are generalized to the case where the mean fields depend not only on density but also on temperature. As an application of general formalism we extend the Walecka model to account for hard core nuclear repulsion. The effects of this modification on the phase boundary between the hadron matter and the quark-gluon plasma and on main thermodynamic functions are considered.

2219 (JAERI-M–94-028, pp. 30-44) **Mass model for unstable nuclei.** Moeller, P. (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Nix, J.R. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

We present some essential features of a macroscopic-microscopic nuclear-structure model, with special emphasis on the results of a recent global calculation of nuclear masses. We discuss what should be some minimal requirements of a nuclear mass model and study how the macroscopic-microscopic method and other nuclear mass models fulfill such basic requirements. We study in particular the reliability of nuclear mass models in regions of nuclei that were not considered in the determination of the model parameters. (author) 50 refs.

2220 (JINR-R–4-94-137) **One-phonon excitations in hot nuclei.** Vdovin, A.I.; Kosov, D.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 18p. (In Russian). Order Number DE95607311. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The RPA equations in a hot nucleus are derived within the formalism of the thermodynamics. Following the main prescriptions of the TFD we express the Hamiltonian of the quasiparticle-phonon nuclear model with a separable effective interaction in both particle-particle and particle-hole channels in terms of the so-called thermal quasiparticle operators. This has been done by two successive canonical transformations - the usual Bogoliubov transformation and the thermal Bogoliubov transformation. The coefficients of the transformations are determined by minimizing the free energy potential of a hot nucleus in the thermal vacuum state. Then the RPA part of the thermal Hamiltonian is extracted and the variational principle is used to derive the equations for thermal one-phonon states. For the case when only particle -hole interaction is taken into account, our results coincide with the results of the Green function method and the equation-of-motion method. This approach can be extended beyond the RPA as well. 15 refs. (author).

2221 (LA-SUB–94-131) **Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993.** Los Alamos National Lab., NM (United States); Moller (P.) Scientific Computing and Graphics, Inc., Los Alamos, NM (United States). [1993]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001744. Source: OSTI; NTIS; INIS; GPO Dep.

This task involved the calculation of neutron and proton radii of cesium isotopes. The author has written a computer code that calculates radii according to two models: Myers 1983 and FRDM 1992. Results of calculations in both these models for both cesium and francium isotopes are attached as figures. He is currently interpreting these results in collaboration with D. Vieira and J.R. Nix, and they expect to use the computer code for further studies of nuclear radii.

2222 (LYCEN-T–9235) **Nuclear moments of transitional nuclei in the vicinity of Z=40 and Z=82 shells.** Jesus, M. De. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire; Lyon-1 Univ., 69 (France). Apr 1992. 103p. (In French). Order Number DE95607222. Source: OSTI; NTIS (US Sales Only); INIS.

With the NICOLE facility on-line to the isotope separator ISOLDE-3 at CERN we obtained on the gyromagnetic factors of ^{182,184m,184g}Au using the nuclear spin-lattice relaxation phenomena; this new method uses a radioactive pulsed beam and a time resolved detection. We developed an algorithm based on the relaxation theory which allows to calculate the time evolution of the angular distribution of γ-radiation emitted in radioactive decay of oriented nuclei. The possibilities for the ^{182}Au spin value were reduced to I=2,3,4; its half-life was reevaluated to $T_{1/2}(^{182}Au)$ = 15.6(4)s. The first on-line experiment carried out at NICOLE on ^{184}Au showed the existence of an unknown long-lived isomeric state which decays to the short-lived ground state through an M3 transition. Our results indicate that the most probable spin sequence is 3^+ and 6^+ for the isomeric and ground state, respectively; the half-lives are $T_{1/2}$ (^{184m}Au) = 48(1)s and $T_{1/2}$ (^{184}Au)=19(1)s. Magnetic moments of ^{91m}Y, ^{95}Zr and ^{97}Nb and quadrupole moments of ^{95}Zr and ^{95}Nb have been measured using the time-integral nuclear orientation and the nuclear magnetic resonance methods at low temperature. The measured magnetic moment —μ(^{95}Zr)— =1.131(20)μ_N gives a quadrupole deformation ϵ 0.06 - 0.07 for ^{95}Zr using the Nilsson model with a Coriolis mixing term. This deformation explains the observed value for the quadrupole moment Q(^{95}Zr) = +0.29(5) eb. The small oblate deformation of ^{95}Nb is in agreement with the spectroscopic quadrupole moment Q(^{95}Nb) = -0.28(10) eb. (author). 120 refs., 43 figs., 13 tabs.

2223 (OUP–94-12) **Asymmetric nuclear matter and neutron star properties.** Engvik, L. (Fysisk Inst., Oslo Univ. (Norway)); Hjorth-Jensen, M.; Osnes, E.; Bao, G.; Oestgaard, E. Oslo Univ. (Norway). Fysisk Inst. Jun 1994. 13p. Order Number DE95607223. Source: OSTI; NTIS; INIS.

Properties of neutron stars such as mass and radius, using a relativistic Dirac-Brueckner-Hartree-Fock approach, are calculated. Modern meson-exchange potential models are used to evaluate the G-matrix for asymmetric nuclear matter. For pure neutron matter the maximum mass is found to be $M_{max} \approx 2.4M$ for a radius R $\approx$ 12 km. With a proton fraction of 30% the result is $M_{max} \approx 2.1M$ for a radius R $\approx$ 10.5 km, close to the experimental values. The implications are discussed. 20 refs., 3 figs.

6632 Radioactivity and Electromagnetic Transitions (Excluding Fission)

Refer also to citation(s) 2007

2224 (AREAEE–310) **Determination of relative efficiency of a GMX-detector.** Fouad, M.F.; Elsourgy, A.A.; Comsan, M.N.H.

Nuclear Research Centre, Inshas (Egypt). 1991. 19p. Order Number DE95607359. Source: OSTI; NTIS (US Sales Only); INIS.

The energies and relative intensities of gamma rays from the decay of the ^{226} Ra, ^{57} Co, ^{133} Ba and ^{241} Am have been measured for reevaluating the relative full energy peak efficiency of the Orotic type (GMX-10190) GMX-HPGe coaxial detector. The correction for nonlinearity in the spectrometer system the dependence of resolution of the system on the shaping time of the amplifier were performed. 5 fig.

2225 (GSI–94-06) **First measurements of the beta decay into bound states of the electron: $^{163}_{66}Dy^{66+} \rightarrow ^{163}_{67}Ho^{66+}$ + anti ν_e.** Jung, M. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany); Technische Univ. Muenchen, Garching (Germany). Fakultaet fuer Physik. Jan 1994. 86p. (In German). Order Number DE95711700. Source: OSTI; NTIS (US Sales Only); INIS.

In this thesis the first direct measurement of the β^- decay into bound states of the electron is described. In this kind of the beta decay the new originating electron is not emitted from the atomic formation, but remains bound to the nucleus. Therefore this kind of decay is called "bound beta decay" (β_b decay). The energy set free (Q-value) is in the bound beta decay nearly by the amount of the binding energy of the electron larger than in the normal beta decay. For neutral atoms the β_b decay has only marginal importance, because here only weakly bound states are available for the electron (Pauli principle). With increasing degree of ionization of the atoms however the possible binding energy of the new electron and by this the probability for β_b decay increases essentially. High atomic charge states are present in the interior of hot stellar plasmas during the synthesis of the heavy elements (A>56). A typical temperature for the s process is for instance T=4*10^{8}K, which corresponds to an energy of kT similar 30 keV. By this the bound beta decay plays an important role in the stellar nucleosynthesis. First by ion storage rings (respectively ion traps) it has been possible to obtain heavy highly charged ions for some time and to study such decays. For the first experimental detection of the β_b decay competely ionized $^{163}_{66}Dy^{66+}$ was selected. It decays by bound beta decay to the hydrogen-like $^{163}_{67}Ho^{66+}$. (Neutral ^{163}Dy however is absolutely stable.) This decay was detected in the experimental storage ring ESR of the GSI Darmstadt detected. The measured half-life $T_{1/2}{}^{\beta}{}_b$=(48±3) days agrees very well with the theoretical prediction $T_{1/2}{}^{\beta}{}_b$=50 days of K. Takahashi et al. (1987).

2226 (GSI–94-47(prepr.)) **Beta decay of the new isotope ^{101}Sn.** Janas, Z. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Keller, H.; Kirchner, R.; Klepper, O.; Piechaczek, A.; Roeckl, E. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Aug 1994. 16p. Order Number DE95711377. Source: OSTI; NTIS (US Sales Only); INIS.

The very neutron-deficient isotope ^{101}Sn has been produced in a ^{50}Cr(^{58}Ni, 2p5n) reaction and its decay has been studied for the first time. Energy and time spectra of beta-delayed protons emitted from samples that were prepared by using chemically selective ion sources of an on-line mass separator have been measured. The half-life of ^{101}Sn was determined to be 3±1 s. The results obtained are compared to theoretical predictions. (orig.)

2227 (GSI–94-52(prepr.)) **Beta-decay of ^{20}Mg.** Piechaczek, A. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Mohar, M.F.; Anne, R.; Borrel, V.; Brown, B.A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Aug 1994. 33p. Order Number DE95715282. Source: OSTI; NTIS (US Sales Only); INIS.

The β-decay of ^{20}Mg was investigated. A secondary beam of ^{20}Mg ions, produced in reactions between a 95 A x MeV ^{24}Mg-beam and a ^{nat}Ni-target, was isotopically separated by means of the LISE3 spectrometer at GANIL. This secondary beam was implanted into a silicon detector array surrounded by germanium γ-detectors. The β-delayed proton and γ-ray data, measured for this short-lived nucleus ($T_{1/2}$=95±3 ms), were incorporated into an improved ^{20}Mg→^{20}Na decay scheme. The 2645 keV level in ^{20}Na is of importance for the breakout from the astrophysical hot CNO-cycle and the onset of the rapid proton capture process via the reaction ^{19}Ne(p,γ)^{20}Na. An upper limit of 0.1% for the β-decay feeding of the 2645 keV level and a lower limit for the corresponding log ft value of 6.24 were determined. The implications of this result for the spin and parity assignment of the 2645 keV state are discussed. Concerning the isobaric multiplet mass equation no significant deviation from its quadratic form was found. By comparing the ^{20}Mg β-decay into the proton-unbound 3001 keV state in ^{20}Na and the isospin-mirrored decay into the particle-bound 3488 keV level in ^{20}F, an asymmetry $ft^+/ft^- - 1 = 1.69_{-0.65}{}^{+0.86}$ was observed. (orig.)

6633 Nuclear Reactions and Scattering, General

2228 (GANIL-T–93-04) **Stochastic approach in the dynamics of nuclear collisions.** Boilley, D. Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France). Sep 1993. 141p. (In French). Order Number DE95607368. Source: OSTI; NTIS (US Sales Only); INIS.

In order to study the influence of fluctuations on various phenomena linked to heavy ion collisions a Langevin equation has been derived from a microscopic model. Parameters entering this equation are completely determined from microscopic quantities characterizing nuclear matter. This equation has been applied to various physical phenomena at intermediate energies. A first part is devoted to small amplitude collective motions, especially giant resonances. Memory effects in the collision term of Boltzmann equation have been studied. A formal approach to the influence of the fluctuations on several coupled modes is proposed. A second part is devoted to large amplitude collective motions, where a detailed study of thermal fission is done. Fission rate is calculated and compared to experimental results. Finally, some preliminary work on multifragmentation is also proposed. (author). 77 refs., 19 figs.

2229 (ITF–94-3) **The microscopical two axial rotators model for the nucleus with the different neutron and proton shell configurations.** Filippov, G.F.; Dotsenko, I.S.; Lisetskij, A.F. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 12p. (In Russian). Order Number DE95607370. Source: OSTI; NTIS (US Sales Only); INIS.

The method of the construction of the wave functions in the nuclear model of two axial rotators is considered on the microscopic base. A special attention is paid to the case of the different neutron and proton shell configurations. The above mentioned method is a direct generalization of the construction technique of the wave functions which was previously proposed by the authors for the nucleus with the proton and neutron subsystems of identical configurations.

2230 (ITP–93-23) **Coherent and incoherent elastic proton scattering by ^{6} Li nucleus at intermediate energies.** Peresypkin, V.V.; Zhusupov, M.A.; Ibraeva, E.T.; Kukulin, V.I. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1993. 24p. Order Number DE95607371. Source: OSTI; NTIS (US Sales Only); INIS.

The differential cross-sections of the elastic coherent and incoherent (with the excitation 3^+ state) proton scattering by ^{6} Li nucleus are calculated on the basis of the Glauber-Sitenko diffraction theory. In calculations we have used a three-particle wave function of ^{6} Li and its refined version with antisymmetrization. These two describe well experimental cross-sections measured in Saclait. It is shown for the coherent scattering that the diffraction minimum is partially occupied in the cross-section due to the D-wave contribution to the ^{6} Li wave function whose weight is 3-7% in various calculation versions.

2231 (JINR-E–2-94-126) **Regge theory inspired model on nuclear destruction in high energy nucleus-nucleus interactions.** El-Waged, Kh. (Benha University, (Egypt). Physics department); Uzhinskij, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 12p. Order Number DE95605341. Source: OSTI; NTIS (US Sales Only); INIS.

A nuclear destruction model based on Regge theory of cascading into the nucleus is presented. The validity of the model is tested in the projectile and target fragmentation regions. A good agreement is obtained for g-particle multiplicity distributions on spectator charge flow (Q_{zd}) and distributions on spectator fragment energy (E_{zdc}). 18 refs.; 10 figs. (author).

2232 (JINR-E-2-94-127) **Do fragment multiplicity distributions obey any kind of scaling ?.** El-Waged, Kh. (Benha University, (Egypt). Physics department); Uzhinskij, V.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 14p. Order Number DE95605342. Source: OSTI; NTIS (US Sales Only); INIS.

Scaling property of the fragment multiplicity distributions is studied in the framework of two-dimensional bond/site percolation models. It is shown that experimental α-particle multiplicity distributions can be described only in bond percolation model, and at critical value of percolation parameter the normalized moments of all fragment multiplicity distribution decrease with increasing mass number of fragmenting nuclei. Predictions for the forthcoming experimental Au fragmentation into α-fragments are made. 30 refs.; 5 figs. (author).

6634 Specific Nuclear Reactions and Scattering

Refer also to citation(s) 1587, 2160, 2161, 2178, 2209, 2222, 2232

2233 (BNL–60809) **Summary of heavy ion theory.** Gavin, S. Brookhaven National Lab., Upton, NY (United States). Sep 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-940816–38: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002177. Source: OSTI; NTIS; INIS; GPO Dep.

Can we study hot QCD using nuclear collisions? Can we learn about metallic hydrogen from the impact of comet Shoemaker-Levy 9 on Jupiter? The answer to both questions may surprise you! I summarize progress in relativistic heavy ion theory reported at DPF '94 in the parallel sessions.

2234 (BNL–60923) **Few body physics with polarized photons.** Sandorfi, A.M. Brookhaven National Lab., Upton, NY (United States). [1994]. 15p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);Istituto Nazionale di Fisica Nucleare, Rome (Italy);Deutsche Forschungsgemeinschaft, Bonn (Germany);United States-Israel Binational Science Foun DOE Contract AC02-76CH00016. (CONF-9409103–1: International symposia on high energy spin physics and polarization phenomena in nuclear physics, Bloomington, IN (United States), 15-22 Sep 1994). Order Number DE95002229. Source: OSTI; NTIS; INIS; GPO Dep.

I've been asked to give an overview of recent experiments with polarized photons. Polarization observables enhance interference effects that often remain hidden in spin-averaged, unpolarized measurements. Access to such interference effects allows us to tackle new problems and gain new insights. But, because the effects are often subtle, progress is almost always linked to calculations with reasonably sophisticated models. That automatically drives the attention to few-body systems where such calculations can be carried out with reasonable accuracy. There is quite a collection of new experiments with polarized may beams. I'm going to discuss the highlights from a few, focusing on those areas where polarization tells us something really new. Each of these experiments are the work of moderately large collaborations and their composition is given at the beginning of each section. We begin with a short review of polarized photon sources.

2235 (DOE/ER/40561–141) **Source dimensions in ultrarelativistic heavy ion collisions.** Herrmann, M.; Bertsch, G.F. Washington Univ., Seattle, WA (United States). 16 May 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-90ER40561. Order Number DE94012853. Source: OSTI; NTIS; INIS; GPO Dep.

Recent experiments on pion correlations, interpreted as interferometric measurements of the collision zone, are compared with models that distinguish a prehadronic phase and a hadronic phase. The models include prehadronic longitudinal expansion, conversion to hadrons in local kinetic equilibrium, and rescattering of the produced hadrons. The longitudinal radius measured in collisions of 200 GeV/u sulfur nuclei on a heavy target require the existence of a prehadronic phase which converts to the hadronic phase at densities around 0.8 GeV/fm^3. The transverse radii cannot be reproduced without introducing more complex dynamics into the transverse expansion.

2236 (DOE/ER/40768–2) **The theory of relativistic heavy ion collisions: [Annual] progress report, [July 1, 1993–June 30, 1994].** Shuryak, E. State Univ. of New York, Stony Brook, NY (United States). Dept. of Physics. Jul 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93ER40768. Order Number DE95001805. Source: OSTI; NTIS; INIS; GPO Dep.

For clarity of presentation, we have divided the topics of interest into the following main topics which are discussed in this report: the dynamics of nuclear collisions at very high energies (RHIC and LHC); electromagnetic probes; the dynamics of nuclear collisions at AGS energies; and non-perturbative QCD and the physics of the phase transition.

2237 (FNAL/C–94/219-E) **Nuclear A dependence of exclusive vector meson production in muon scattering.** Schellman, H. (Northwestern Univ., Evanston, IL (United States). Dept. of Physics and Astronomy). E665 Collaboration. Fermi National Accelerator Lab., Batavia, IL (United States). Jul 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03000. (CONF-940327–13: 29. Moriond meeting on quantum chromodynamics and high energy hadronic interactions, Les Arcs (France), 12-26 Mar 1994). Order Number DE95002248. Source: OSTI; NTIS; INIS; GPO Dep.

Results on exclusive vector meson production from Fermilab muon scattering experiment E665 are presented. The A dependence of exclusive vector meson production is studied as a function of Q^2. The data show a significant change in the dependence on A at higher values of Q^2. The observed behavior is consistent with the idea of color transparency.

2238 (FZR–50(prepr.)) **Rapidity dependence of thermal dileptons resulting from hadronizing quark-gluon matter with finite baryon charge.** Kaempfer, B. (Forschungszentrum Rossendorf e.V. (FZR), Dresden (Germany)); Pavlenko, O.P.; Gorenstein, M.I.; Peshier, A. Forschungszentrum Rossendorf e.V. (FZR), Rossendorf bei Dresden (Germany). Jul 1994. 19p. Order Number DE95715033. Source: OSTI; NTIS (US Sales Only); INIS.

The influence of a non-vanishing baryon charge on the rapidity distribution of dileptons produced in ultrarelativistic heavy-ion collisions is studied. We employ a frozen motion model with scaling invariant expansion of the hadronizing quark-gluon plasma as well as a realistic rapidity distribution of secondary particles (i.e., pions and baryons) expected for RHIC energies. We find a considerable suppression of the dilepton production yield at large rapidities due to the finite baryon density. To discriminate the thermal dileptons from Drell-Yan background we propose to utilize the dilepton yield scaled suitably by the pion multiplicity as function of rapidity. (orig.)

2239 (GSI–94-46(prepr.)) **Fragment flow and the multifragmentation phase space.** Kunde, G.J. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Hsi, W.C.; Kunze, W.D.; Schuettauf, A. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). 9 Aug 1994. 15p. Order Number DE95715735. Source: OSTI; NTIS (US Sales Only); INIS.

Fragment distributions have been measured for Au + Au collisions at E/A = 100 MeV and 1000 MeV. A high detection efficiency for fragments in nearly 4π geometry was obtained by combining the Aladin forward spectrometer system and the MSU-Miniball/WU-Miniwall array. At both energies the maximum multiplicity of intermediate mass fragments normalized to the size of the decaying system is about one IMF per 30 nucleons but the element distributions show significant differences. Within a coalescence picture the suppression of heavy fragments in central collisions at E/A = 100 MeV may be related to a reduction of the density in momentum space which is caused by the collective expansion velocity component. (orig.)

2240 (GSI–94-54(prepr.)) **Neutron removal in peripheral relativistic heavy ion collisions.** Aumann, T. (Mainz Univ. (Germany). Inst. fuer Kernchemie); Bertulani, C.A.; Suemmerer, K.

Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 17p. Order Number DE95711147. Source: OSTI; NTIS (US Sales Only); INIS.

We investigate the relativistic Coulomb fragmentation of ^{197}Au by heavy ions, leading to one-, two- and three-neutron removal. To resolve the ambiguity connected with the choice of a specific minimum impact parameter in a semiclassical calculation, a microscopic approach is developed based on nucleon-nucleon collisions ('soft-spheres' model). This approach is compared with experimental data for ^{197}Au at 1 GeV/nucleon and with a calculation using the 'sharp-cutoff' approximation. We find that the harmonic-oscillator model predicting a Poisson distribution of the excitation probabilities of multiphonon states gives a good agreement with one-neutron removal cross sections but is unable to reach an equally good agreement with three-neutron removal cross sections. (orig.)

2241 (GSI–94-60(prepr.)) **Radiochemical search for neutron-rich isotopes of nielsbohrium in the ^{16}O + ^{254}Es reaction.** Schaedel, M. (Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany)); Jaeger, E.; Bruechle, W.; Suemmerer, K.; Hulet, E.K.; Wild, J.F. Gesellschaft fuer Schwerionenforschung mbH, Darmstadt (Germany). Sep 1994. 23p. Order Number DE95715046. Source: OSTI; NTIS (US Sales Only); INIS.

We have used on-line gas chromatography to search for new isotopes of element 107 near the deformed sub-shell at N = 162 and Z = 108. Enhanced nuclear stability is predicted for this region. ^{254g}Es was irradiated with ^{16}O at barrier energies to minimize the fusion hindrance in the entrance channel and to reduce the excitation energy of the compound nucleus to a minimum value. For half-lives between roughly two seconds and two minutes no signal for a positive identification of a new isotope of element 107 was detected. Consequently, only an upper cross-section limit of a few nanobarns was obtained. While this cross-section limit was too high to probe the influence of the predicted enhanced nuclear ground-state stability on the survival probability in the fission/evaporation competition, a very large cross-section enhancement would have been detectable. (orig.)

2242 (INDC(NDS)–304) **Progress in fission product nuclear data. No. 14: Information about activities and requirements in the field of measurements and compilations/evaluations of fission product nuclear data (FPND).** Lammer, M. (comp.) (International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section). International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee. Jun 1994. 139p. Order Number DE95607487. Source: OSTI; NTIS (US Sales Only); INIS.

This is the 14th issue of a report series on Fission Product Nuclear Data published by the Nuclear Data Section of the IAEA. The types of activities included are measurements, compilations and evaluations of fission product yields, neutron reaction cross sections of fission products, data related to the radioactive decay of fission products, delayed neutron data from neutron induced and spontaneous fission, lumped fission product data. The first part of the report consists of unaltered original contributions which the authors have sent to IAEA/NDS. The second part contains some recent references relative to fission product nuclear data, which were not covered by the contributions submitted, and selected papers from conferences. The third part contains requirements for further measurements.

2243 (IPNO-DRE–93-17) **Hadronization in nuclear matter.** Anton, G. (Bonn Univ. (Germany). Physikalisches Inst.); Berrier-Ronsin, G.; Bertin, P.Y.; Bialas, A.; Blok, H.P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. [48p.] Order Number DE95607390. Source: OSTI; NTIS (US Sales Only); INIS.

The investigation of the space time structure of quark propagation and hadronization is proposed by studying particle production in deep-inelastic scattering of electrons from nucleons and nuclei with high statistics. A 15 to 30 GeV electron beam impinging on targets of hydrogen, deuterium, helium, carbon and lead is planned to be used and the final state hadrons are to be detected in a large solid angle device. (authors). 48 refs., 13 figs., 4 tabs.

2244 (IPNO-DRE–93-20) **Blocking effect in the $16^+ \rightarrow 16^+$ (p,t) transition on the isomeric ^{178}Hf^{m2} target.** Rotbard, G. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Berrier-Ronsin, G.; Constantinescu, O.; Fortier, S.; Gales, S.; Hussonnois, M.; Briancon, Ch.; Kulessa, R.; Oganessian, Yu.Ts.; Karamian, S.A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. [10p.] Order Number DE95607395. Source: OSTI; NTIS (US Sales Only); INIS.

The availability of the ^{178}Hf^{m2} target, a four-quasiparticle aligned 16^+ state, has allowed to observe for the first time a blocking effect for a L=0(p,t) transition between even-even nuclei. The same effect should be expected on an even-even target in a neutron quasiparticle aligned state. (authors). 13 refs., 3 figs., 1 tab.

2245 (IPNO-DRE–93-21) **Spectroscopic factors from one-proton stripping reactions on sd-shell nuclei: Experimental measurements and shell model calculations.** Vernotte, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Berrier-Ronsin, G.; Kalifa, J.; Tamisier, R.; Wildenthal, B.H. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. [70p.] Order Number DE95607415. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics, A (NL).

The (^{3}He,d) reaction has been investigated at 25 MeV on different target nuclei in the A range from 16 to 39. Values of the single-nucleon spectroscopic factors C^2S are obtained from the differential cross sections measured for these levels by analyzing them in the framework of the DWBA theory of nuclear reactions. The effects of the spin-orbit part of the bound-state potential on j=l+1/2 and j=l-1/2 transitions have also been carefully investigated. The results are compared with shell model calculations. (K.A.) 48 refs., 10 figs., 10 tabs.

2246 (IPNO-DRE–93-28) **Separation and implantation of relativistic ^{86}Kr-fragments at the FRS: Half-life measurement by ion-β time-correlations.** Czajkowski, S. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Bernas, M.; Armbruster, P.; Geissel, H.; Kozhuharov, C.; Dessagne, Ph.; Miehe, Ch.; Hanelt, E.; Audi, G. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 27 Oct 1993. [17p.] Order Number DE95607427. Source: OSTI; NTIS (US Sales Only); INIS.

Neutron-rich Co and Fe isotopes produced by ^{86}Kr projectile fragmentation at 500 MeV/u have been separated and identified using the Fragment Separator (FRS) in a bunched energy mode. ^{66}Co and ^{65}Fe ions were selectively implanted in a double PIN-diode array where the β-decay signals were measured. The half-lives were deduced from time correlations between implantation and β-decay signals. The re-measurement of the ^{66}Co half-life confirms the isotope identification. The value of ^{65}Fe half-life was found to be 0.45±0.15 s. (authors). 18 refs., 5 figs.

2247 (IPNO-DRE–93-30) **Vector meson production at CERN.** Gerschel, C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 13p. (CONF-930999–: NATO Advanced Study Institute on hot and dense nuclear matter, Bodrum (Turkey), 26 Sep - 9 oct 1993). Order Number DE95607428. Source: OSTI; NTIS (US Sales Only); INIS.

Search for quark-gluon plasma in heavy ion reactions with oxygen and sulfur beams in CERN is presented. Charmonium state and strangeness production is studied. The underlying basic physics and the experimental results are summarized. (K.A.). 38 refs., 8 figs., 2 tabs.

2248 (IPNO-DRE–93-32) **Exclusive and restricted inclusive reactions involving the ^{11}Be one-neutron halo.** Anne, R. (Grand Accelerateur National d'Ions Lourds (GANIL), 14 - Caen (France)); Emling, H.; Hansen, P.G.; Hornshoj, P.; Humbert, F.; Jonson, B.; Keim, M. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. [45p.] Contracts 06DA 641I; 06MZ 188I. Order Number DE95607429. Source: OSTI; NTIS (US Sales Only); INIS.

Reactions of a 41 MeV/u beam of the radioactive halo nucleus ^{11}Be have been studied with a counter telescope coupled to an array of neutron detectors. The technique allows to determine single-neutron inclusive and exclusive angular distributions. The targets (Be, Ti and Au) were chosen to illustrate the relative roles played by nuclear and Coulomb mechanisms. It is shown that for

the dissociation process it is possible to account almost quantitatively for the integral, single- and double-differential cross-sections from models without free parameters including the Coulomb, Serber and Glauber (diffraction dissociation) mechanisms. (K.A.). 56 refs., 11 figs., 1 tab.

2249 (IPNO-DRE–93-33) **Exclusive measurements of Δ excitation by the (^{3}He,t) reaction.** Hennino, Th. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Dec 1993. 14p. (CONF-9305386–: Workshop on Δ excitation in nuclei, Riken (Japan), 27-29 May 1993). Order Number DE95607430. Source: OSTI; NTIS (US Sales Only); INIS.

The production of Δ in nuclei through charge exchange reactions induced by medium energy light projectiles has been undertaken at Laboratoire National Saturne. The possible existence of a pionic collective mode built on Δ-hole correlations has been proposed to explain medium effects which appeared in inclusive experiments. Using the Diogene 4π apparatus to detect the charged particles, the decay pattern of the Δ-hole states has been separated into its different modes. 3 of them deserve particular attention: the quasi free Δ production, the two nucleon absorption channel and the coherent mode. (author). 17 refs., 10 figs.

2250 (IPNO-DRE–94-02) **^{29}Si(d,^{3}He)^{28}Al reaction at 29 MeV.** Vernotte, J. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Berrier-Ronsin, G.; Fortier, S.; Hourani, E.; Kalifa, J.; Maison, J.M.; Rosier, L.H.; Rotbard, G.; Khendriche, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. [47p.] Order Number DE95607416. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, C (Nuclear Physics) (US).

The ^{29}Si(d,^{3}He)^{28}Al reaction has been investigated at 29 MeV incident energy. Observations using a split-pole magnetic spectrograph have been made of 55 levels of ^{28}Al in the range of excitation energy between 0 and 6.7 MeV. The spectroscopic factors have been obtained for 23 of these levels through distorted-wave Born approximation (DWBA) analyses of measured angular distributions. Four levels which are populated through the pick-up of a l_p=1 proton have been observed. The excitation energies and spectroscopic factors for positive-parity states were compared with the results of a recent, complete sd-shell space, shell-model calculation. This comparison led to the identification of 21 shell-model levels with experimental levels. (K.A.). 29 refs., 8 figs., 4 tabs.

2251 (IPNO-DRE–94-07) **New fission fragments discovered in collisions of relativistic ^{238}U ions with Pb target nuclei.** Bernas, M. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Donzaud, C.; Czajkowski, S.; Armbruster, P.; Dessagne, Ph.; Miehe, Ch.; Faust, H.R.; Hesse, M.; Hanelt, E.; Heinz, A. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1994. [15p.] Order Number DE95607432. Source: OSTI; NTIS (US Sales Only); INIS.

Projectile fission of ^{238}U was investigated at a bombarding energy of 750 AMeV using a Pb target. Forward emitted fragments from ^{80}Zn up to ^{155}Ce were analyzed with the Fragment Separator (FrS) and unambiguously identified by their energy-loss and time-of-flight. The magnetic selection of the largest momenta acted as a trigger of low energy fission component. More than forty new nuclear species were identified. The related isotopic production cross-sections are presented. (authors). 13 refs., 4 figs., 1 tab.

2252 (IPNO-DRE–94-09) **Total d+d → α+η cross sections near threshold.** Frascaria, R. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Roudot, F.; Duval, M.A.; Wurzinger, R.; Spang, W.; Ernst, J.; Hinterberger, F.; Jahn, R.; Joosten, R.; Goldzahl, L. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 22 Mar 1994. 17p. Order Number DE95607417. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, C (Nuclear Physics) (US).

The total cross section for η production in deuteron-deuteron interactions has been measured at four different kinetic energies, from 0.7 MeV to 3.7 MeV above threshold. The squared amplitude is consistent with a constant value of $\overline{|f|^2}$=(24.6±1.2±1.7) nb/sr close to threshold (14<p_η<40 MeV/c). Assuming that the π^0-η mixing reaction mechanism is dominant, this result allows a prediction of $(d\sigma/d\Omega)_{(\pi^0)}$=(8.3±0.5±0.6) pb/sr for the cross section of the isospin-forbidden reaction d+d → α+π^0 at the η-threshold energy. (authors). 25 refs., 3 figs., 1 tab.

2253 (JAERI-M–94-028, pp. 13-19) **Collective flow and particle production in high energy heavy ion collisions.** Maruyama, Tomoyuki (Kyoto Univ. (Japan). Faculty of Science). Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (In Japanese). (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

We introduce momentum-dependent scalar and vector fields into the Lorentz covariant relativistic BUU- (RBUU-) approach. The momentum-dependent parametrization is valid up to about 1 GeV/u for the empirical proton-nucleus optical potential. We perform numerical simulations for heavy-ion collisions within the RBUU-approach adopting momentum-dependent and momentum-independent mean-fields and calculate the transverse flow as well as subthreshold K^+-production. By means of these observables we discuss the particular role of the momentum-dependent forces and their implications on the nuclear equation of state. We find that only a momentum-dependent parameter-set can explain the experimental data on the transverse flow in the reaction plane from 150-1000 MeV/u and the differential K^+-production cross sections at 1 GeV/u at the same time. (author).

2254 (JAERI-M–94-028, pp. 53-58) **Status of intermediate energy nuclear data.** Fukahori, Tokio (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

In this paper, requests and present status of IEND is reported from an engineering side, and needs of IEND are described from a view point of several application. Present conditions on experimental databases and calculation codes for evaluation in the intermediate energy region are introduced. For the future work, a project of the evaluated intermediate energy nuclear data file is reported. (J.P.N.).

2255 (JAERI-M–94-028, pp. 66-69) **Neutron measurement for the reactions induced by high-energy protons.** Ishibashi, K. (Kyushu Univ., Fukuoka (Japan). Faculty of Engineering); Nakamoto, T.; Matsufuji, N. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

The experiment on the neutron-emission double-differential cross section was carried out at proton energies of 0.8, 1.5 and 3 GeV at the KEK. The targets were C, Al, Fe, In and Pb. Experimental results of the cross section showed the effects of the fragmentation at the incident energy of 3 GeV. (author).

2256 (JAERI-M–94-028, pp. 92-96) **Pauli blocking and internucleus potential effects on total reaction cross section.** Nara, Yasushi (Hokkaido Univ., Sapporo (Japan). Dept. of Physics); Ohnishi, Akira. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (In Japanese). (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

We have applied a microscopic simulation method called Anti-symmetrized Molecular Dynamics (AMD) to calculations of the total reaction cross section. The effects of the Pauli blocking and internuclear potential on the total reaction cross section are analyzed in this method. The reactions X+^{12}C, X=d, ^{3}He, ^{4}He, over an energy range from 10MeV/A to 1GeV/A are analyzed and the calculated results show good agreement with experimental data. It is shown that each of these effects, which are ignored in the usual Glauber type calculation, amounts to about 20% at low energy regions. A

large cancellation between these effects can be seen in the reaction with d and ^{3}He induced reactions, however, in the case of α-induced reaction, the effects of the Pauli-blocking is much larger than those of nuclear potential. We have also applied this method to the reactions induced by unstable nuclei ^{6}He. (author).

2257 (JAERI-M–94-028, pp. 111-114) **QMD calculation of nucleon-nucleus reaction cross sections.** Chiba, Satoshi (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment). Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. (CONF-9310346–: 1. symposium on simulation of hadronic many-body system, Tokai (Japan), 18-20 Oct 1993). In *Proceedings of the first symposium on simulation of hadronic many-body system.* 147p. Order Number DE94792668. Source: OSTI; NTIS; INIS.

The purpose of this work is to give our first (and mostly preliminary) result on the applicability of QMD to nucleon-induced reactions. This paper gives a simple explanation of the concept and typical examples of the calculation carried out in the energy region from 26 to 60 MeV. (J.P.N.).

2258 (JINR-E–1-94-154) **Polarization phenomena in deuteron-proton backward elastic scattering, d + p -> p + d.** Sitnik, I.M. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Ladygin, V.P.; Rekalo, M.P. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 4p. Order Number DE95605353. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to 'Few Body XIV Conference', May, 1994, US.

Effects due to the polarization of both colliding particles have been analysed in terms of four independent amplitudes which in the general case define the spin structure of the d p backward elastic scattering amplitude. It is shown that spin correlation due to the transverse polarization of colliding particles has high sensitivity respect to presumably existing of P-wave in the deuteron. The experiments needed to be performed for complete reconstruction of four independent amplitudes are discussed. 9 refs.; 1 fig. (author).

2259 (JINR-E–1-94-155) **New data on T_{20} in inclusive deuteron breakup at 9 GeV/c on protons and correlation between polarization observables.** Azhgirej, L.S. (Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy); Afanas'ev, S.V.; Chernykh, E.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 4p. Order Number DE95605354. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to 'Few body XIV Conference', May, 1994, US.

We present here new preliminary data on the tensor analyzing power T_{20} of the breakup reaction p(d, p) X at 0^0 obtained up to internal momentum of the deuteron constituents K $\approx$ 0.8 GeV/c. The experiment was done using the ALPHA setup at the Dubna synchrophasotron. The experimental data on polarization observables in the deuteron breakup are analyzed on the k_0 -T_{20} plane. This plot indicates that either the DWF has additional components, (N*N P-wave), or that complicated spin dependent graphs modify the spin state of the detected proton. 10 refs.; 2 figs. (author).

2260 (JINR-E–1-94-156) **Measurements of T_{20} in backward elastic d p scattering at deuteron momenta 3.5 - 6 GeV/c.** Azhgirej, L.S. (and others); Borzunov, Yu.T.; Chernykh, E.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 4p. Order Number DE95605355. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Few Body 24 Conference, May 1994, USA.

We present results of measurements of the tensor analyzing power T_{20} in d p backward elastic scattering at initial deuterons momenta 3.5-6.0 GeV/c, which corresponds to the range of internal momentum of the deuteron constituents k = 0.5 - 0.8 GeV/c. New structure was observed at k = 0.65 GeV/c. Difference between behavior of T_{20} for d p backward elastic scattering and for breakup reaction, which have a smooth behavior of T_{20} at high k, is discussed. 12 refs.; 3 figs. (author).

2261 (JINR-E–4-94-157) **Conserved currents for ed-e' N N, ed-e'd' and γd - N N reactions in the framework of three-dimensional field theoretical formulation.** Machavariani, A.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. Order Number DE95605344. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Physics. A.

Proceeding from the field-theoretical decomposition for amplitudes of coupled N N-γ d channel, the relativistic covariant and three-dimensional representations for amplitudes of ed - e'N N, ed - e'd' and γ - N N reactions are derived. The amplitudes of photon-deuteron scattering satisfy the current conservation condition in every order of the perturbation theory. But for the electron-deuteron cases for restore gauge invariance in suggesting relativistic equations with a finite number of particles in intermediate states we have used additional terms in the microscopic potentials. These potentials consist of the on-mass-shell particle exchange parts and equal-time commutators or so called sea gull terms. In contrast to other field-theoretical formulations as input functions by construction the microscopic potential in the suggested approach are required one-variable covariant vertex functions. The availability of equal time commutators in microscopic potentials enables to verify the approximation of intermediate particle number restriction in considered equations. 30 refs.; 5 figs. (author).

2262 (JINR-E–7-94-136) **New statistical function for the angular distribution of evaporation residues produced by heavy ions.** Rigol, J. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 6p. Order Number DE95605357. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods.

A new statistical function has been found for modelling the angular distribution of evaporation residues produced by heavy ions. Experimental results are compared with the calculated ones. 11 refs.; 4 figs. (author).

2263 (JINR-R–1-94-98) **The properties of nucleon clusters production in (p, d) + Ta and (p, d) + C interactions over energy range from 4.2 to 10 GeV/c per nucleon.** Dedovich, T.G.; Didenko, L.A.; Kuznetsov, A.A. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy. 1994. 18p. (In Russian). Order Number DE95605347. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The properties of nucleon clusters have been investigated in (p, d) + Ta and (p, d) + C interactions over an energy range from 4.2 to 10 GeV?c per nucleon. These processes are considered in a space the points of which are 4-velocities $u_i = p_i/m_i$ where p_i and m_i are the 4-momenta and masses of particles involved in the reaction respectively, and $b_{ik} = -(u_i - u_k)^2$ $[(u_i u_k - 1)]$ are basic variables describing the relative particle motion in this space. It has been observed that the properties of nucleon clusters in (p, d) + Ta and (p, d) + C interactions are universal on the two similarity parameters b_k and x_k, i.e. they depend on neither the type of the colliding objects nor its energy. The results are compared with our earlier obtained data about nucleon cluster and hadron jet production in different hadron and nuclear reactions over an energy range from 4 to 205 GeV. 9 refs.; 8 figs.; 5 tabs. (author).

2264 (JINR-R–4-94-129) **(γ, n) cross section in heavy nuclei in the region of the giant quadrupole resonance.** Belyaev, S.N. (Saratovskij Gosudarstvennyj Univ., Saratov (Russian Federation). Nauchno-Issledovatel'skij Inst. Mekhaniki i Fiziki); Vasil'ev, O.V.; Nechkin, A.A.; Semenov, V.A.; Voronov, V.V.; Ponomarev, V.Yu. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. (In Russian). Order Number DE95605345. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Yadernaya Fizika.

The yield of photoneutrons is measured in ^{208} Pb and ^{209} Bi by using the Bremsstrahlung with the endpoint energy in the range 7-26 MeV. The data from the energy range 20-26 MeV are analyzed to obtain information on the structure and parameters of the GQR. The parameters of the Gaussian curves approximating the cross sections are determined, which allows one to estimate the contribution of different states to the total cross section. Experimental cross sections in ^{208} Pb are compared with strength functions of photoexcitation of 1^- and 2^+ states calculated within the quasiparticle-phonon model. 42 refs.; 7 figs.; 2 tabs. (author).

2265 (JINR-R-7-94-134) **The investigation of the cross sections of Po isotopes formation in the ^{27} Al + ^{175} Lu and ^{31} P + ^{169} Tm reactions.** Andreev, A.N.; Bogdanov, D.D.; Eremin, A.V.; Kabachenko, A.P.; Malyshev, O.N.; Muzychka, Yu.A.; Pustyl'nik, B.I.; Sagajdak, R.N.; Ter-Akopyan, G.M.; Chepigin, V.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions. 1994. 16p. (In Russian). Order Number DE95605358. Source: OSTI; NTIS (US Sales Only); INIS.

The cross sections of $^{192-196}$ Po isotopes formation in the reactions ^{27} Al + ^{175} Lu and ^{31} P + ^{169} Tm have been measured. From the comparison of the obtained data with the data on the cross sections of Po isotopes in the reactions ^{100} Mo + $^{92-100}$ Mo there has been made a conclusion that the evaporation channel characteristics are independent of the mass of the bombarding ion up to the full symmetry in the input channel. It has been demonstrated also that a satisfactory description of the experimental data in the frame of the statistical approach to the process of the compound nucleus deexcitation is possible only in the assumption of a substantial decrease of the liquid drop fission barrier for neutron deficient isotopes of Po. 21 refs.; 7 figs.; 2 tabs. (author).

2266 (LA–12639-MS) **New thermal neutron scattering files for ENDF/B-VI release 2.** MacFarlane, R.E. Los Alamos National Lab., NM (United States). Mar 1994. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (ENDF–356). Order Number DE95002247. Source: OSTI; NTIS; INIS; GPO Dep.

At thermal neutron energies, the binding of the scattering nucleus in a solid, liquid, or gas affects the cross section and the distribution of secondary neutrons. These effects are described in the thermal sub-library of Version VI of the Evaluated Nuclear Data Files (ENDF/B-VI) using the File 7 format. In the original release of the ENDF/B-VI library, the data in File 7 were obtained by converting the thermal scattering evaluations of ENDF/B-III to the ENDF-6 format. These original evaluations were prepared at General Atomics (GA) in the late sixties, and they suffer from accuracy limitations imposed by the computers of the day. This report describes new evaluations for six of the thermal moderator materials and six new cold moderator materials. The calculations were made with the LEAPR module of NJOY, which uses methods based on the British code LEAP, together with the original GA physics models, to obtain new ENDF files that are accurate over a wider range of energy and momentum transfer than the existing files. The new materials are H in H_2O, Be metal, Be in BeO, C in graphite, H in ZrH, Zr in ZrH, liquid ortho-hydrogen, liquid para-hydrogen, liquid ortho-deuterium, liquid para-deuterium liquid methane, and solid methane.

2267 (LA-SUB–94-142) **Nuclear data review and compilation for ATW systems.** Guzhovskii, B.; Gorelov, V.; Il'in, V.; Farafontov, G.; Grebennikov, A. Los Alamos National Lab., NM (United States); California Univ., Berkeley, CA (United States). [1994]. 252p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95001747. Source: OSTI; NTIS; INIS; GPO Dep.

In order to solve the problem of nuclear power waste transmutation in neutron flux it is necessary to know the characteristics of neutron interaction for a great number of nuclei in the energy range from 0 to hundreds of MeV. The authors distinguished the most important aspect of this problem that one of nuclear data for actinides, (from Th to Cm isotopes) They have given the overview of evaluations of characteristic of interaction between neutrons and these nuclei leading to transformation from target-nucleus to neighboring actinide-nucleus or fission fragments in the limited energy range from 0 to 14 MeV. The review was carried out by comparison of mentioned characteristics from the modern versions of ENDL-82, JENDL-3, ENDF/B-6 and BROND-2 neutron evaluated data among themselves and with recommended data of previous publications and, in some cases, with the measurement results. ENDL-82 and ENDF/B-6 versions were made in USA laboratories, JENDL-3 was made in the laboratories of Japan and BROND-2 version was made in the laboratories of former USSR. The comparison of nuclear data from various libraries was carried out by the most economic method permitting, nevertheless, fully judge of available uncertainties in the knowledge of competitive nuclear data which are important from the point of view of problem of transmutation in various energies neutron flux. The following characteristics were considered: (a) fission and capture cross-sections at thermal point (E_n=0.0253 eV); (b) infinitely dilute resonance integrals of fission and capture designated by I_f and I_γ (c) averaged on ^{252}Cf spontaneous fission neutron spectrum cross-sections of fission, capture and the (n,2n) reactions; (d) cross-sections of fission and the (n,2n), (n,3n) reactions at the point En = 14 MeV; (e) fission and capture resonance integrals for a interval of sets with the increasing upper (E_{max}) and lower (E_{min}) limits of integral.

2268 (LBL–36087) **Heavy residues from very mass asymmetric heavy ion reactions.** Hanold, K.A. Lawrence Berkeley Lab., CA (United States). Aug 1994. 125p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC03-76SF00098. Grant NGT-50783. Order Number DE95002331. Source: OSTI; NTIS; INIS; GPO Dep.

The isotopic production cross sections and momenta of all residues with nuclear charge (Z) greater than 39 from the reaction of 26, 40, and 50 MeV/nucleon ^{129}Xe + Be, C, and Al were measured. The isotopic cross sections, the momentum distribution for each isotope, and the cross section as a function of nuclear charge and momentum are presented here. The new cross sections are consistent with previous measurements of the cross sections from similar reaction systems. The shape of the cross section distribution, when considered as a function of Z and velocity, was found to be qualitatively consistent with that expected from an incomplete fusion reaction mechanism. An incomplete fusion model coupled to a statistical decay model is able to reproduce many features of these reactions: the shapes of the elemental cross section distributions, the emission velocity distributions for the intermediate mass fragments, and the Z versus velocity distributions. This model gives a less satisfactory prediction of the momentum distribution for each isotope. A very different model based on the Boltzman-Nordheim-Vlasov equation and which was also coupled to a statistical decay model reproduces many features of these reactions: the shapes of the elemental cross section distributions, the intermediate mass fragment emission velocity distributions, and the Z versus momentum distributions. Both model calculations over-estimate the average mass for each element by two mass units and underestimate the isotopic and isobaric widths of the experimental distributions. It is shown that the predicted average mass for each element can be brought into agreement with the data by small, but systematic, variation of the particle emission barriers used in the statistical model. The predicted isotopic and isobaric widths of the cross section distributions can not be brought into agreement with the experimental data using reasonable parameters for the statistical model.

2269 (LBL–36103) **Strange particle and antiproton production in S + nucleus collisions at 200 GeV/nucleon.** Margetis, S. NA35 Collaboration. Lawrence Berkeley Lab., CA (United States). Jun 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-940816–43: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002348. Source: OSTI; NTIS; INIS; GPO Dep.

Central S+S, S+Ag and S+Au collisions at 200 GeV/nucleon were studied in experiment NA35 at the CERN SPS. Recent results on strange particle production as well as the preliminary results on antiproton production are presented and discussed. Enhanced strangeness production relative to the pion and antiproton yields is observed in nucleus-nucleus collisions relative to p-p and p-A. Microscopic string models fail to consistently describe the available set of data.

2270 (LBL–36104) **Stopping and two-pion Bose-Einstein correlation results from CERN experiment NA35.** Mitchell, J.T. NA35 Collaboration. Lawrence Berkeley Lab., CA (United States). Jun 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-940816–42: Meeting of the Division of Particles and Fields of the American Physical Society, Albuquerque, NM (United States), 2-6 Aug 1994). Order Number DE95002332. Source: OSTI; NTIS; INIS; GPO Dep.

Two probes of relativistic heavy ion collisions at 200 GeV/A are discussed. The extent of nuclear stopping via measurement of "proton" rapidity distributions is presented as a function of centrality. The amount of stopping seen is consistent with what is expected from proton-nucleus data at similar energies. Also, two-pion Bose-Einstein correlations are presented as a function of rapidity and relative transverse momentum. These results are discussed in terms of a simple hydrodynamical model.

2271 (LBL–36105) **Flow and multifragmentation in nuclear collisions at intermediate energies.** Ritter, H.G. EOS Collaboration. Lawrence Berkeley Lab., CA (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC03-76SF00098 ; FG02-89ER40531 ; FG02-88ER40408 ; FG02-88ER40412 ; FG05-88ER40437. (CONF-940509–6: Conference on nucleus-nucleus collisions, Catania (Italy), 30 May - 4 jun 1994). Order Number DE95002347. Source: OSTI; NTIS; INIS; GPO Dep.

Energy spectra of hydrogen and helium isotopes emitted in Au+Au collisions at 0.25, 0.40, 0.60, 0.80, 1.0, and 1.15A GeV have been measured. A systematic study of the shapes of the spectra reveals a significant non-thermal component consistent with collective radial flow. The strength of this component is evaluated as a function of bombarding energy. Comparisons of the flow signal to predictions of QMD and BUU models are made. Using reverse kinematics, the breakup of gold nuclei has been studied in Au+C reactions at 1.0A GeV. The moments of the resulting charged fragment distribution provide evidence that nuclear matter possesses a critical point observable in finite nuclei. Values for the critical exponents γ, β, and τ have been determined. These values are close to those for liquid-gas systems and different from those for 3D percolation.

2272 (LBL-PUB–5399) **Exclusive study of nuclear collisions at the AGS.** Rai, G. E895 Collaboration. Lawrence Berkeley Lab., CA (United States). Aug 1993. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95002340. Source: OSTI; NTIS; INIS; GPO Dep.

We propose to carry out a systematic and exclusive measurement of the energy and mass dependence of particle production, correlations and collective effects in Au+Au collisions. We wish to determine the highest compression achievable in nuclear matter and to study its properties. We shall search for evidence for an exotic Equation of State, that is, new physics such as Resonance Matter, Exotica, and QGP. We are also interested in signatures of critical phenomena in dilute nuclear matter. We propose to measure the four-momentum of light mass particles ($\pi^{\pm}$, K_s^0, $K^{\pm}$, Λ, n,p,d, ^{3}He, ^{4}He, ^{6}He, and the isotopes of Li and Be), projectile fragments from Z = 6 to Z = 79, and anti-proton production. The majority of the data will be acquired, on an event by event basis, from a state-of-the-art Time Projection Chamber (EOSTPC) built and used at LBL by the EOC collaboration. The TPC provides continuous tracking, almost 4π acceptance and particle identification for the light mass particles.

2273 (LYCEN-T–9219) **Pre-scission light particle emission in the reaction ^{144}Sm (^{32} S, fission) at E_{lab} = 838 MeV: determining of a time scale.** Benrachi, F. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire; Lyon-1 Univ., 69 (France). Jun 1992. 147p. (In French). Order Number DE95607433. Source: OSTI; NTIS (US Sales Only); INIS.

This report has two parts. The first part is devoted to the detection and identification of charged particles with scintillation detectors. The second part refers to the analysis of the ^{32}S + ^{144}Sm reaction at 26 MeV/u. In this fusion-fission reaction, the linear momentum transfer is extracted from the measurement of the correlation angle between the two fission fragments in the laboratory frame. Light charged particles have been observed in coincidence with these fragments. The light charged particles energy spectra are analyzed in the frame of a multisource model. The excitation energy borne by the composite system is estimated from the number of light charged particles and neutrons emitted before equilibrium. The experimental energy spectra of these light particles are compared with the spectra generated by the JULIAN code assuming evaporation from the composite system and from the fission fragments. It is shown that most of the particles are emitted by the fusion nucleus before it undergoes fission. The multiplicities of the pre-scission particles give clear evidence that the time of evaporating and cooling hot nuclei is short as compared to the scission time. (author). 48 refs., 85 figs., 11 tabs.

2274 (OUP–94-13) **Spin dependent pre-equilibrium formation in the ^{163}Dy(^{3}He,α) reaction.** Guttormsen, M.; Bergholt, L.; Rekstad, J.; Tveter, T.S. Oslo Univ. (Norway). Fysisk Inst. Jul 1994. 21p. Order Number DE95607418. Source: OSTI; NTIS; INIS.

The α-particle energy distributions from the ^{163}Dy(^{3}He,α χn γ) reactions with E(^{3}He)=45 MeV have been studied. The α-particles populating $^{158-162}$Dy have been selected by setting gates on the yrast transitions in the respective isotopes. A model based on neutron decay within a Fermi gas is presented. A comparison with the experimental data shows that a substantial part of the decay originates from a hot region of the nucleus. The experimental data are well described by assuming that a part of the decay originates from a region with a low level density parameter of $a \approx 6.0$ MeV^{-1}. The probability of decay from the hot region increases with spin. 14 refs., 8 figs., 2 tabs.

2275 (UM-P–93/66) **The ^{13} C(e,p$_{0,1}$)^{12} B differential cross section.** Zubanov, D. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Thompson, M.N.; Jury, J.W.; Shoda, K. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 16p. Order Number DE95607388. Source: OSTI; NTIS (US Sales Only); INIS.

The differential cross sections for the reactions ^{13}C(γ,p$_o$) and ^{13}C(γ,p$_1$) have been measured in the energy range 21 - 26 MeV. Analysis of the present data and the ^{13}C(γ,p) cross section reveals decay of the GDR at 23 MeV, via the p$_4$ channel. The valence neutron does not appear to interact strongly with the ^{12}C core. Isospin splitting effects are observed. 25 refs., 5 figs.

6635 Nuclear Mass Ranges

Refer also to citation(s) 1587, 2007, 2209, 2212, 2215, 2221, 2225, 2227, 2239, 2240, 2241, 2244, 2245, 2246, 2247, 2248, 2250, 2251, 2256, 2257, 2265, 2267, 2268, 2271, 2274, 2275

2276 (DOE/ER/40723–2) **Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994.** Schier, W.A.; Couchell, G.P. Massachusetts Univ., Lowell, MA (United States). Radiation Lab. [1994]. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-92ER40723. Order Number DE94012482. Source: OSTI; NTIS; INIS; GPO Dep.

Decay heat measurements following the fast fission of ^{238}U are well underway. The He-jet system and spectrometers were moved to the 1 MW research reactor to gain sufficient fast neutron flux for these measurements. On the Van de Graaff accelerator, the He-jet capillary has been shortened so that beta and gamma measurements following the thermal neutron fission of ^{235}U could be made down to delay times near 0.1 s. Gamma-ray response functions are now well characterized for gamma energies up to 1.5 MeV for our large NaI spectrometer. Such response functions out to high energies are needed to extract energy distributions of our measured gamma spectra. The response function unfolding program, FERD-PC, has been operated successfully with trial spectra. Comparisons of individual fission products for ^{235}U(n_{th}f) with ENDF/B-VI at short delay times suggest several improvements to the data base particularly in production probabilities. The new data acquisition and data analysis systems have arrived and will soon be brought on line extending considerably the capabilities of our research group.

6636 Radiation Physics

Refer also to citation(s) 801, 860, 2004

2277 (CONF-941102–29) **Error analysis of the quadratic nodal expansion method in slab geometry.** Penland, R.C. (North Carolina State Univ., Raleigh, NC (United States)); Turinsky, P.J.; Azmy, Y.Y. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society; Washington, DC (United States); 13-18 Nov 1994. Order Number DE95001352. Source: OSTI; NTIS; GPO Dep.

As part of an effort to develop an adaptive mesh refinement strategy for use in state-of-the-art nodal diffusion codes, the authors derive error bounds on the solution variables of the quadratic Nodal Expansion Method (NEM) in slab geometry. Closure of the system is obtained through flux discontinuity relationships and boundary conditions. In order to verify the analysis presented, the authors compare the quadratic NEM to the analytic solution of a test problem. The test problem for this investigation is a one-dimensional slab [0,20cm] with $L^2 = 6.495cm^2$ and D = 0.1429cm. The slab has a unit neutron source distributed uniformly throughout and zero flux boundary conditions. The analytic solution to this problem is used to compute the node-average fluxes over a variety of meshes, and these are used to compute the NEM maximum error on each mesh.

2278 (DOE/ER/25086–T2) **Fast algorithms for transport models: Final report.** Manteuffel, T.A. Colorado Univ., Boulder, CO (United States). Applied Mathematics Program. [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER25086. Order Number DE95001702. Source: OSTI; NTIS; INIS; GPO Dep.

This project has developed a multigrid in space algorithm for the solution of the S_N equations with isotropic scattering in slab geometry. The algorithm was developed for the Modified Linear Discontinuous (MLD) discretization in space which is accurate in the thick diffusion limit. It uses a red/black two-cell μ-line relaxation. This relaxation solves for all angles on two adjacent spatial cells simultaneously. It takes advantage of the rank-one property of the coupling between angles and can perform this inversion in O(N) operations. A version of the multigrid in space algorithm was programmed on the Thinking Machines Inc. CM-200 located at LANL. It was discovered that on the CM-200 a block Jacobi type iteration was more efficient than the block red/black iteration. Given sufficient processors all two-cell block inversions can be carried out simultaneously with a small number of parallel steps. The bottleneck is the need for sums of N values, where N is the number of discrete angles, each from a different processor. These are carried out by machine intrinsic functions and are well optimized. The overall algorithm has computational complexity O(log(M)), where M is the number of spatial cells. The algorithm is very efficient and represents the state-of-the-art for isotropic problems in slab geometry. For anisotropic scattering in slab geometry, a multilevel in angle algorithm was developed. A parallel version of the multilevel in angle algorithm has also been developed. Upon first glance, the shifted transport sweep has limited parallelism. Once the right-hand-side has been computed, the sweep is completely parallel in angle, becoming N uncoupled initial value ODE's. The author has developed a cyclic reduction algorithm that renders it parallel with complexity O(log(M)). The multilevel in angle algorithm visits log(N) levels, where shifted transport sweeps are performed. The overall complexity is O(log(N)log(M)).

6640 Atomic and Molecular Physics

Refer also to citation(s) 2201, 2571

2279 (DOE/ER/12108–T1) **Molecular design concept for multi-kilovolt x-ray amplification: Final report, December 13, 1990–December 14, 1993.** Rhodes, C.K.; McPherson, A.; Boyer, K. Illinois Univ., Chicago, IL (United States). Lab. for Atomic, Molecular, and Radiation Physics. 24 May 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-91ER12108. Order Number DE95001763. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this program is the construction of an X-ray laser in the multi-kilovolt regime which can serve as a vital enabling technology in the broad and fundamental field of materials science. Experimental findings indicate that an entirely new technique for amplification at X-ray wavelengths is feasible. This method involves the combination of (a) a recently discovered mode of multiphoton coupling to molecules which efficiently yields core excited ions, (b) a new channeled mode of propagation for spatial organization, and (c) an ultrahigh brightness subpicosecond laser technology. The concept of molecular X-ray laser design, which involves matching the conditions of excitation to the molecular structure, enables the inner-shell excitation to be selectively achieved. Basically, the molecular approach enables the copious generation of a highly excited species to occur rapidly in an environment characteristic of dense cold matter, a situation exceptionally conducive to X-ray amplification. High energy efficiency and wavelength tunability also appear as intrinsic features of this method. Experimental data concerning the study of five cases [Xe(N), Xe(M), Xe(L), Kr(M), and Kr(L)], spanning-spectrally from ~ 80 eV to ~ 5 keV, have (1) established the important role of cluster formation, (2) verified the scaling of this phenomenon into the kilovolt region, (3) demonstrated the production of hollow atoms having multiple inner-shell vacancies, (4) provided evidence for the crucial influence of coherent electronic motions on the strength of the multiphoton coupling, (5) led to the conclusion that a regime of strong-coupling exists in which multi-electron ejection from an inner-shell can occur with high probability, (6) revealed the scaling in atomic number which potently favors heavy atoms, and (7) combined the multiphoton induced X-ray emission from clusters with channeled propagation.

6641 Theory of Electronic Structure of Atoms and Molecules

2280 (CONF-9411133–1) **A neural network approach to the study of dynamics and structure of molecular systems.** Getino, C.; Sumpter, B.G.; Noid, D.W. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Artificial neural networks in engineering conference; Rolla, MO (United States); 13-16 Nov 1994. Order Number DE95000688. Source: OSTI; NTIS; INIS; GPO Dep.

Neural networks are used to study intramolecular energy flow in molecular systems (tetratomics to macromolecules), developing new techniques for efficient analysis of data obtained from molecular-dynamics and quantum mechanics calculations. Neural networks can map phase space points to intramolecular vibrational energies along a classical trajectory (example of complicated coordinate transformation), producing reasonably accurate values for any region of the multidimensional phase space of a tetratomic molecule. Neural network energy flow predictions are found to significantly enhance the molecular-dynamics method to longer time-scales and extensive averaging of trajectories for macromolecular systems. Pattern recognition abilities of neural networks can be used to discern phase space features. Neural networks can also expand model calculations by interpolation of costly quantum mechanical ab initio data, used to develop semiempirical potential energy functions.

6642 Spectra of Atoms and Molecules and Their Interactions With Photons

Refer also to citation(s) 2293, 2297

2281 (DOE/SF/19202–T1) **X-ray spectroscopy of xenon: Final report.** Feldman, U. Naval Research Lab., Washington, DC (United States). 19 Jan 1994. 20p. Sponsored by USDOE, Washington, DC (United States);Department of the Navy, Washington, DC (United States). DOE Contract FG03-92SF19202. Order Number DE95002132. Source: OSTI; NTIS; GPO Dep.

A high-resolution x-ray spectrometer was constructed and fielded at the National Laser Users Facility at the Laboratory for Laser Energetics, University of Rochester. The spectrometer was attached to a streak camera and time-resolved x-ray spectra recorded. The targets were irradiated by the 24-beam Omega laser and consisted of CH microballoons filled with DD, argon, and xenon. The x-ray spectral lines from Ar and Xe were used to determine the plasma properties of the compressed core region.

2282 (IC–93/424) **Far-infrared and submillimeter spectroscopy of photodissociation regions.** Qaiyum, A. International Centre for Theoretical Physics, Trieste (Italy). Dec 1993. 22p. Order Number DE95607520. Source: OSTI; NTIS (US Sales Only); INIS.

The physical properties of the galactic and extragalactic photodissociation regions, warm gas components molecular clouds are, generally, derived through the far-infrared (FIR) fine structure and submillimeter line emissions arising out of these regions. In the theoretical studies of these lines the model of Tielens and Hollenbach (herein after referred as TH) are usually employed in which all the opacity is assumed local in escape probability formalism and inward directed photons do not escape. These assumptions are contrary to the observational facts, where most of the lines are found optically thin except OI (63 μm) and low rotational transitions of CO and some other molecules. The optically thin medium will allow the radiation to escape through any face of the region. These observational evidences let us to assume finite parallel plane slab, instead of semi-infinite parallel slab, in which the photons are allowed to escape from both surfaces (back and front). In the present study an attempt has been made to incorporate the two sided escape of photons from the PDRs and to study its effect on the FIR and submillimeter line emission from the PDRs/molecular clouds. Further the present formalism is also employed to study the clumpy PDRs/molecular clouds. The preliminary results show that now serious consequences are found on the thermal and chemical structure of the regions but individual line emissions are modified by differing factors. Particularly at low density and low kinetic temperature the change is substantial but at density greater than the critical density of the line and temperature close to the excitation temperature its effect is almost negligible. An attempt has also been made to study the physical conditions of the M17 region employing the present formalism. (author). 49 refs, 8 figs, 1 tab.

2283 (IC–94/177) **Photoionization of shallow donor impurities in finite-barrier quantum wells.** Ilaiwi, K.F. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 9p. Order Number DE95607521. Source: OSTI; NTIS (US Sales Only); INIS.

The dependence of the photoionization cross-section on photon energy is calculated for shallow donors in finite-barrier GaAs/$Ga_{1-x}Al_xAs$ quantum well as well as the binding energy as a function of well width. The effect of magnetic field is also considered. (author). 8 refs, 2 figs.

2284 (INIS-mf–14386, pp. WP40) **Elimination of multiple quantum artifacts in 2D COSY NMR spectra (EMA-COSY).** Bowden, G.J. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Heseltine, T. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. NMR SPECTRA/relaxation losses; RELAXATION LOSSES/signal conditioning; DATA PROCESSING; ELECTROMAGNETIC PULSES; FILTRATION; OPTIMIZATION; RF SYSTEMS; TWO-DIMENSIONAL CALCULATIONS

2285 (INIS-mf–14386, pp. WP65) **Zeeman Effect of the shallow acceptors Boron, Gallium and Thallium in Germanium at magnetic fields up to 7 T.** Baker, R.J. (Wollongong Univ., NSW (Australia)); Fisher, P.; Freeth, C.A.; Ryan, D.S.; Vickers, R.E.M. [1994]. 227p. Sponsored by Australian Research Council, Canberra, ACT (Australia). (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. GERMANIUM/ion implantation; ION IMPLANTATION/zeeman effect; BINDING ENERGY; BORON; DOPED MATERIALS; ENERGY-LEVEL TRANSITIONS; GALLIUM; GERMANIUM; GROUND STATES; IMPURITIES; MAGNETIC FIELDS; SPECTRA; THALLIUM

2286 (INIS-mf–14386, pp. TP31) **Zirconium X-ray emission spectra by an electron probe micro analyser.** Duncan, A. (Telecom Australia Research Laboratories, Clayton, VIC (Australia)); Warminski, T. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRON MICROPROBE ANALYSIS/x-ray emission analysis; ZIRCONIUM/electron microprobe analysis; ZIRCONIUM/energy-level transitions; DATA PROCESSING; ELECTRON BEAMS; STRUCTURAL CHEMICAL ANALYSIS; ZIRCONIUM

6643 Collision Phenomena

Refer also to citation(s) 2402

2287 (AREAEE–292) **Collision integrals for the Lennard-jones (n-6) potential for 23 values of n ranging from 6 to proper to.** Saad, S.M.; ELguebeily, S.; Youssef, A. Nuclear Research Centre, Inshas (Egypt). 1986. 41p. Order Number DE95607536. Source: OSTI; NTIS (US Sales Only); INIS.

Using numerical methods of high accuracy, tables of collision integrals relevant for the evaluation of the transport properties together with higher approximation correction factors are computed for the L.J(n-6) potential at 50 reduced temperatures ranging from 0.1 to 100. 23 values of the exponent are considered, namely 6, 7, 8, 9, 10, 11, 12, 15, 18, 21, 24, 30, 40, 50, 60, 75, 90, 120, 150, 200, 300, and 600, The first and the last exponents representing respectively the L J(6-6)[1] and sutherland potentials. Comparisons are made with other calculations for the case n=12. The accuracy of the calculations appears to be of the order of several parts in 10000. 23 tab.

2288 (DOE/ER/13519–8) **Experimental study of interactions of highly charged ions with atoms at keV energies: Progress report, February 16, 1993–April 15, 1994.** Kostroun, V.O. Cornell Univ., Ithaca, NY (United States). 27 Apr 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13519. Order Number DE95001807. Source: OSTI; NTIS; INIS; GPO Dep.

Experimental study of low energy, highly charged ions with other atomic species requires an advanced ion source such as an electron beam ion source, EBIS or an electron cyclotron ion source, ECRIS. Five years ago we finished the design and construction of the Cornell superconducting solenoid, cryogenic EBIS (CEBIS). Since then, this source has been in continuous operation in a program whose main purpose is the experimental study of interactions of highly charged ions with atoms at keV energies. This progress report for the period February 16, 1993 to April 15, 1994 describes the work accomplished during this time in the form of short abstracts.

2289 (JINR-E–4-94-141) **Vacuum polarization effects in low-energy muonic atom collisions.** Melezhik, V.S. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems. 1994. 11p. Order Number DE95605393. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review Letters.

We estimate the vacuum polarization (V P) correction to the Coulomb interaction in collisions of muonic atoms. It is shown that the V P effect, amplified by the low-lying virtual state $\epsilon_v \approx 10$ eV, is of the order $\approx$ 1-2% in the S-wave cross sections for $p\mu + p$ collisions as $\epsilon \leq \epsilon_v$. The V P amplitude becomes comparable to the anomalously small pure Coulomb amplitude for the singlet $t\mu + t$ scattering as $\epsilon \to 0$ and near the Ramsauer-Townsend minima in the $d\mu + p$ and $t\mu + p$ scattering. 17 refs.; 4 figs.; 1 tab. (author).

2290 (JINR-R–4-94-143) **Inelastic collisions of negative muons and hadrons with metastable hydrogen atoms.** Korenman, G.Ya. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Lkhagva, O.; Tsookhuu, Kh.; Badamdamdin, R. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. (In Russian). Order Number DE95607537. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Vestnik Moskovskogo Universiteta, Seriya 3. Fizika, Astronomiya.

We consider inelastic collisions of slow negative muons and hadrons on a hydrogen atom in metastable 2 s-state. The calculations were using both diabatic and adiabatic bases. It is shown that both approaches reproduce similar qualitative peculiarities of ionization and Coulomb capture for collisions between M^- particle

and metastable atom. Ionization and Coulomb capture cross sections exceed the corresponding values for ground state by more than one order of magnitude. Slowing-down and capture kinetic characteristics also depend on the presence of metastable atoms essentially. 23 refs.; 10 figs.; 2 tabs. (author).

2291 (JINR-R–4-94-146) **Inelastic collisions of negative muons and hadrons with Helium metastable atoms.** Korenman, G.Ya. (Moskovskij Gosudarstvennyj Univ., Moscow (Russian Federation). Nauchno-Issledovatel'skij Inst. Yadernoj Fiziki); Lkhagva, O.; Tsookhuu, Kh. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics. 1994. 15p. (In Russian). Order Number DE95607538. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Vestnik Moskovskogo Universiteta, Seriya 3. Fizika, Astronomiya.

We consider inelastic collisions of slow negative muons and hadrons on He(2^1 S, 2^3 S) atoms at velocity $v < 1$ a.u. The semiclassical solution of the problem of two- and three-particle close coupled channels is used. Diabatic terms for excited states pass to continuum at the distances $R_* \approx$ 5-10 a.u. which are greater essentially of those for ground state term ($\approx$ 1 a.u.). These distances play the role of inelastic interaction radii. The inelastic cross sections are at least one order of magnitude greater than that for ground state. They depend appreciably on the spin of initial state. Kinetic characteristics of slowing-down and capture of the particles are acutely sensitive to presence of metastable atoms. Slowing-down time in the energy range under study is reduced by factor 2-3 at 100% concentration of metastable atoms. Primary distribution of captured particles on orbits hits to the binding energy region $\epsilon \leq 0.15$ a.u. whereas for ordinary He target $\epsilon \leq 0.9$ a.u. Circular orbits with principal quantum number up to n=156 are populated when antiproton is captured by metastable atom. It offers a possibility to study new region of metastable states of hadrons in Helium. 22 refs.; 10 figs.; 2 tabs. (author).

6644 Experimentally Derived Information On Atomic and Molecular Properties

Refer also to citation(s) 2310

2292 (DOE/ER/14145–T3) **Physics of correlated studies: Final report, September 1, 1990–November 30, 1993.** Greene, C.H. Colorado Univ., Boulder, CO (United States). [1993]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-90ER14145. Order Number DE95001204. Source: OSTI; NTIS; INIS; GPO Dep.

During the three year period of this grant, a major initiative was started to develop theoretical methods to treat complex open-shell atoms in a manner permitting a simple interpretation of the dynamics. This project has been far more successful than originally hoped, with accurate ground state photoionization cross sections calculated for nine different open-shell atoms in the periodic table. This work culminated in our first application to multichannel autoionizing spectra of a transition metal atom, scandium. These methods were also extended and adapted to permit a description of nonresonant two-photon processes at the perturbative level, and some nonperturbative multiphoton processes. The angular distribution of photoelectrons ejected in resonant multiphoton ionization of magnesium was also successfully calculated. We made headway toward understanding aspects of the diamagnetic quasi-Landau problem, specifically interpreting the observed simplicity of the spectrum when plotted simultaneously versus energy and field. High two-electron excitations of H^- and Li^- were treated using R-matrix methods, combined with a time delay analysis to quantitatively test various propensity rules proposed in the literature. These calculations also gave the first accurate description of H^- experiments at Los Alamos, up to the n = 6 threshold. A new set of computer programs were developed to handle double-Rydberg "planetary" states of barium and strontium, incorporating long range multipole interactions explicitly. Finally, we studied triply-excited states of H^{--} in an attempt to clarify the question of whether such resonances exist. Each of these projects is described in greater detail below.

2293 (INIS-mf–14386, pp. TP17) **Zeeman shifts and splittings of hydride vibrational lines in rare-earth doped calcium fluoride.** Jones, J. (Canterbury Univ., Christchurch (New Zealand). Dept. of Physics); Strikland, N. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting*. Order Number DE95605568.

Short communication. HYDRIDES/zeeman effect; CALCIUM FLUORIDES; CRYSTAL DOPING; ELECTRONIC STRUCTURE; HYDRIDES; LINE BROADENING; MAGNETIC MOMENTS; RARE EARTH ADDITIONS; TETRAGONAL LATTICES; VIBRATIONAL STATES

2294 (IS-T–1709) **Photodissociation and photoionization of organosulfur radicals.** Hsu, Chia-Wei. Ames Lab., IA (United States). 27 May 1994. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE95001687. Source: OSTI; NTIS; INIS; GPO Dep.

The dynamics of $S(^3P_{2,1,0}, {}^1D_2)$ production from the 193 nm photodissociation of CH_3SCH_3, H_2S and CH_3SH have been studied using 2 + 1 resonance-enhanced multiphoton ionization (REMPI) techniques. The 193 nm photodissociation cross sections for the formation of S from CH_3S and HS initially prepared in the photodissociation of CH_3SCH_3 and H_2S are estimated to be 1×10^{-18} and 1.1×10^{-18} cm^2, respectively. The dominant product from CH_3S is $S(^1D)$, while that from SH is $S(^3P)$. Possible potential energy surfaces involved in the 193 nm photodissociation of $CH_3S(\tilde{X})$ and SH(X) have been also examined. Threshold photoelectron (PE) spectra for SH and CH_3S formed in the ultraviolet photodissociation of H_2S and CH_3SH, respectively, have been measured using the nonresonant two-photon pulsed field ionization (N2P-PFI) technique. The rotationally resolved N2P-PFI-PE spectrum obtained for SH indicates that photoionization dynamics favors the rotational angular momentum change $\Delta N < 0$ with the ΔN value up to -3, an observation similar to that found in the PFI-PE spectra of OH (OD) and NO. The ionization energies for $SH(X^2\Pi_{3,2})$ and $CH_3S(\tilde{X}^2E_{3/2})$ are determined to be 84,057.5 $\pm$ 3 cm^{-1} and 74,726 $\pm$ 8 cm^{-1} respectively. The spin-orbit splittings for $SH(X^2\Pi_{3/2,1/2})$ and $CH_3S(\tilde{X}^2E_{3/2,1/2})$ are found to be 377 $\pm$ 2 and 257 $\pm$ 5 cm^{-1}, respectively, in agreement with previous measurements. The C-S stretching frequency for $CH_3S^+(\tilde{X}^3A_2)$ is 733 $\pm$ 5 cm^{-1}. This study illustrates that the PFI-PE detection method can be a sensitive probe for the nascent internal energy distribution of photoproducts.

2295 (LA-UR–94-3533) **Parity nonconservation in radioactive atoms: An experimental perspective.** Vieira, D. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9406212–3: Antibes conference on nuclear shapes and nuclear structure at low excitation energies, Antibes (France), 20-25 Jun 1994). Order Number DE95002737. Source: OSTI; NTIS; INIS; GPO Dep.

The measurement of parity nonconservation (PNC) in atoms constitutes an important test of electroweak interactions in nuclei. Great progress has been made over the last 20 years in performing these measurements with ever increasing accuracies. To date the experimental accuracies have reached a level of 1 to 2%. In all cases, except for cesium, the theoretical atomic structure uncertainties now limit the comparison of these measurements to the predictions of the standard model. New measurements involving the ratio of Stark interference transition rates for a series of Cs or Fr radioisotopes are foreseen as a way of eliminating these atomic structure uncertainties. The use of magneto-optical traps to collect and concentrate the much smaller number of radioactive atoms that are produced is considered to be one of the key steps in realizing these measurements. Plans for how these measurements will be done and progress made to date are outlined.

2296 (LBL–36197) **Study of small carbon and semiconductor clusters using negative ion threshold photodetachment spectroscopy.** Arnold, C.C. Lawrence Berkeley Lab., CA (United States). Aug 1994. 308p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC03-76SF00098. Order Number DE95002327. Source: OSTI; NTIS; INIS; GPO Dep.

The bonding and electronics of several small carbon and semiconductor clusters containing less than ten atoms are probed using negative ion threshold photodetachment (zero electron kinetic energy, or ZEKE) spectroscopy. ZEKE spectroscopy is a particularly advantageous technique for small cluster study, as it combines mass selection with good spectroscopic resolution. The ground and low-lying electronic states of small clusters in general can be accessed by detaching an electron from the ground anion state. The clusters studied using this technique and described in this work are C_6^-/C_6, Si_n^-/Si_n (n = 2, 3, 4), Ge_2^-/Ge_2, In_2P^-/In_2P,InP_2^-/InP^2, and Ga_2As^-. The total photodetachment cross sections of several other small carbon clusters and the ZEKE spectrum of the $I^- \cdot CH_3I$ S_N2 reaction complex are also presented to illustrate the versatility of the experimental apparatus. Clusters with so few atoms do not exhibit bulk properties. However, each specie exhibits bonding properties that relate to the type of bonding found in the bulk. C_6, as has been predicted, exhibits a linear cumulenic structure, where double bonds connect all six carbon atoms. This double bonding reflects how important π bonding is in certain phases of pure carbon (graphite and fullerenes). The symmetric stretch frequencies observed in the C_6^- spectra, however, are in poor agreement with the calculated values. Also observed as sharp structure in total photodetachment cross section scans was an excited anion state bound by only ~40 cm^{-1} relative to the detachment continuum. This excited anion state appears to be a valence bound state, possible because of the high electron affinity of C_6, and the open shell of the anion.

6645 Special Atoms and Molecules

2297 (IC–94/148) **Dynamic Jahn-Teller-Induced infrared absorption of a charged C^-_{60} molecule.** Wang Wen-zheng (Los Alamos National Lab., Los Alamos, NM (United States). Theoretical Div.); Bishop, A.R.; Yu Lu. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 14p. Order Number DE95607577. Source: OSTI; NTIS (US Sales Only); INIS.

The observable consequences of the dynamic Jahn-Teller effect due to quantum-fluctuations between the six degenerate D_{5d} polaronic configurations on a singly charged C^-_{60} molecule are considered. The multi-phonon infrared absorption spectrum is calculated taking into account the dynamic symmetry breaking. Some of the Jahn-Teller active (also Raman-active) modes are predicted to be observable as multi-phonon overtones in the infrared absorption. (author). 28 refs, 2 figs.

6650 Physics of Condensed Matter

Refer also to citation(s) 1154, 1232, 2019

2298 (IC–94/137) **The λ-bar exponent for conservative systems.** Rao, M. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 6p. Order Number DE95607661. Source: OSTI; NTIS (US Sales Only); INIS.

Assuming the scaling form for the two-time correlation function, it follows that the nontrivial exponent λ-bar is exactly equal to the spatial dimension d for any system with a conserved order parameter, as long as the initial variance of the magnetisation is nonzero. The result holds for conserved vector order parameters and for quenches to any temperature $T \leq T_c$. (author). 12 ref.

2299 (IC–94/138) **Dynamics of phase ordering of nematics in a pore.** Bhattacharya, A. (Pennsylvania State Univ., University Park, PA (United States). Dept. of Chemistry); Rao, M.; Chakrabarti, A. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 16p. Order Number DE95607662. Source: OSTI; NTIS (US Sales Only); INIS.

We study the kinetics of phase ordering of a nematic liquid crystal, modeled by a spin-rotor Hamiltonian, confined within a parallel piped pore. The dynamics of the rotor obeys the time-dependent Ginzburg-Landau equation. We study the generation and evolution of a variety of defect structures, and the growth of domains, with different anchoring conditions at the pore surface. Unlike in binary fluids, mere confinement with no anchoring field, does not result in slow dynamics. Homeotropic anchoring, however, leads to slow logarithmic growth. Interestingly, homogeneous anchoring dynamically generates wall defects, resulting in an Ising like structure factor at late times. (author). 27 refs, 4 figs.

2300 (IC–94/145) **Domain growth in weakly disordered magnets: A coupled map lattice approach.** Biswal, B. (Jawaharlal Nehru Univ., New Delhi (India). School of Physical Sciences); Puri, S.; Chowdhury, D. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 16p. Order Number DE95607663. Source: OSTI; NTIS (US Sales Only); INIS.

We developed a novel numerical method of studying domain growth in the Ising-type models. Using this method we investigate the laws of domain growth in random-exchange Ising model. (author). 23 refs, 5 figs.

2301 (IC–94/190) **Optical instabilities and chaos due to the virtual formation of biexcitons.** Nguyen Trung Dan. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 10p. Order Number DE95607664. Source: OSTI; NTIS (US Sales Only); INIS.

Optical instabilities and chaos due to virtual formation of biexcitons in optically excited semiconductors are investigated. A complete linear stability analysis of steady-state bistable solutions of nonlinear coupled differential equations describing the nonlinear dynamics of semiconductors is carried out. The dynamical solutions are studied numerically using an iterative procedure. (author). 20 refs, 3 figs.

2302 (INIS-mf–14386, pp. WP58) **GaAs conduction bands observed by inverse photoemission spectroscopy.** Sheils, W. (La Trobe Univ., Bundoora, VIC (Australia)); Leckey, R.C.G.; Riley, J.D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. GALLIUM ARSENIDES/photoemission; GALLIUM ARSENIDES/vacuum states; ELECTRONIC STRUCTURE; EMISSION SPECTROSCOPY; PHOTOEMISSION; LCAO METHOD; MUFFIN-TIN POTENTIAL

2303 (INIS-mf–14386, pp. WP71) **An application of X-Ray computerized tomography for examining the internal features of materials.** Lee, G.N. (Royal Melbourne Institute of Technology, Melbourne, VIC (Australia). Dep. of Applied Physics); Kijek, M.M.; Millar, J.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. BONE TISSUES/computerized tomography; BONE TISSUES/porosity; MAGNESIUM ALLOYS/computerized tomography; MAGNESIUM ALLOYS/fractures; POROSITY; CRACK PROPAGATION; CRYSTAL DEFECTS; FRACTURES; MICROSTRUCTURE; NONDESTRUCTIVE TESTING

2304 (INIS-mf–14386, pp. TP05) **Tight binding calculations of the surface electronic DOS of graphite.** McKinnon, B.A. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Choy, T.C. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. GRAPHITE/electron density; GRAPHITE/tunnel effect; TUNNEL EFFECT/scanning electron microscopy; BINDING ENERGY; DYSON REPRESENTATION; ELECTRONIC STRUCTURE; ENERGY-LEVEL DENSITY; GRAPHITE; GREEN FUNCTION; SURFACE PROPERTIES

2305 (INIS-mf–14393, pp. 84-85) **Polarization effects on the electron density of lone pairs.** Olovsson, I. (Uppsala Univ. (Sweden). Inst. of Chemistry); Ptasiewicz-Bak, H.; McIntyre, G.J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland).

[1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 ref., 1 fig. X-RAY DIFFRACTION/chemical bonds; X-RAY DIFFRACTION/electron density; HYDRATES; NICKEL SULFATES; TEMPERATURE RANGE 0013-0065 K

2306 (LBL–35940) **Resonant generation of nonequilibrium phonons in GaAs/AlAs quantum wells via intersubband scattering.** Su, Z.P. (Univ. of California, Berkeley, CA (United States). Dept. of Physics); Ruf, T.; Wald, K.R.; Yu, P.Y.; Chan, K.T. Lawrence Berkeley Lab., CA (United States). Jul 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9408155–11: 22. international conference on physics of semiconductors, Vancouver (Canada), 15-19 Aug 1994). Order Number DE95002338. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have studied the resonant intersubband scattering of optical phonons or RISOP theoretically and by picosecond scattering. Experimentally, the authors have established a way to determine phonon occupancy in quantum wells. The model calculation shows that a significant amount of long wavelength LO phonons are generated by RISOP in GaAs/A1As quantum wells. However, they measured a much smaller phonon population than predicted. The discrepancy can be explained by a breakdown of in-plane wavevector conservation due to interface roughness.

2307 (SAND–94-1670C) **Complementary GaAs junction-gated heterostructure field effect transistor fabrication for integrated circuits.** Baca, A.G.; Zolper, J.C.; Sherwin, M.E.; Robertson, P.J.; Shul, R.J.; Howard, A.J.; Rieger, D.J.; Klem, J.F. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941063–7: 186. meeting of the Electrochemical Society, Miami, FL (United States), 9-14 Oct 1994). Order Number DE95001522. Source: OSTI; NTIS; GPO Dep.

A new GaAs junction-gated complementary logic technology that integrates a modulation doped p-channel heterostructure field effect transistor (pHFET) and a fully ion implanted n-channel JFET has recently been fabricated. High-speed, low-power operation has been demonstrated with loaded ring oscillators that show gate delays of 179 ps/stage for a power-delay product of 28 fJ at 1.2 V operation and 320 ps/stage and 8.9 fJ at 0.8 V operation. The principal advantages of this technology include the ability to independently set the threshold voltage of n- and p-channel devices and to independently design the pHFET for high performance. A self-aligned refractory gate process based on tungsten and tungsten silicide gate metal has been used to fabricate the FETs. Novel aspects of the fabrication include the simultaneous formation of non-alloyed, refractory ohmic contacts for the junction gates and the formation of shallow p-n junctions by ion implantation.

6651 Nuclear Techniques In Condensed Matter Physics

Refer also to citation(s) 58, 1122, 1123, 1127, 1132, 1134, 1188, 1198, 1205, 1209, 1221, 1253, 1255, 1257, 1259, 1261, 1313, 1638, 1673, 2358, 2386

2308 (BNL–60900) **Image quality, surface statistics and all that.** Church, E.L. (Army Armament Research and Development Command, Dover, NJ (United States)); Takacs, P.Z. Brookhaven National Lab., Upton, NY (United States). Jul 1993. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-930722–61: Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE), San Diego, CA (United States), 11-16 Jul 1993). Order Number DE95002465. Source: OSTI; NTIS; GPO Dep.

This paper describes and illustrates simple expressions for determining the effects of conventional and fractal surface errors on the performance of a simple imaging system, and conversely, of specifying surface-finish parameters in terms of system performance requirements.

2309 (BNL–60903) **Surface x-ray scattering and scanning tunneling microscopy studies at the Au(111) electrode.** Ocko, B.M.; Magnussen, O.M.; Wang, J.X.; Adzic, R.R. Brookhaven National Lab., Upton, NY (United States). [1993]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9307153–1: NATO Advanced Study Institute on vortices in superconductors, Cargese (France), 19-31 Jul 1993). Order Number DE95002409. Source: OSTI; NTIS; INIS; GPO Dep.

This chapter reviews Surface X-ray Scattering and Scanning Tunneling Microscopy results carried out at the Au(111) surface under electrochemical conditions. Results are presented for the reconstructed surface, and for bromide and thallium monolayers. These examples are used to illustrate the complementary nature of the techniques.

2310 (BNL–60934) **Photoemission and ferromagnetism.** Johnson, P.D. Brookhaven National Lab., Upton, NY (United States). [1994]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95002419. Source: OSTI; NTIS; INIS; GPO Dep.

Photoemission is a well established technique for the study of the electronic structure of atoms and solids. In particular, angle-resolved photoemission has been used extensively to map the band structure of clean and adsorbate covered surfaces, both metal and semiconductor. Extending the technique by measuring the spin of the photoemitted electrons allows the possibility of examining the exchange split band structures characterizing ferromagnetic systems. Here the technique becomes particularly useful in the study of the magnetic properties of surfaces, thin films and associated interfaces.

2311 (DOE/ER/13506–52) **Electrical and photoelectrochemical characterization of CdS particulate films by scanning electrochemical microscopy, scanning tunneling microscopy, and scanning tunneling spectroscopy.** Zhao, X.K. (J&D Scientific, Inc., Mesa, AZ (United States)); McCormick, L.; Fendler, J.H. Syracuse Univ., NY (United States). Dept. of Chemistry. [1991]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER13506. (CONF-911202–90: Annual fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 2-6 Dec 1991). Order Number DE95002510. Source: OSTI; NTIS; GPO Dep.

Cadmium sulfide particulate films have been generated at monolayer interfaces. Controlled and infusion of hydrogen sulfide onto compressed monolayers prepared from cadmium arachidate resulted in the formation of covalent metal sulfide bonds at a large number of sites at the monolayer-aqueous interface. The initial nucleation resulted in the downward growth of well-separated, metal-sulfide microclusters which grew in height and width and coalesced into interconnected arrays of semiconductor particles.

2312 (DOE/ER/79236–1) **Advanced growth and surface analysis system for in situ studies of interface formation: Annual technical report.** Sayers, D.E.; Nemanich, R.J.; Wang, Z. North Carolina State Univ., Raleigh, NC (United States). 10 Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-93ER79236. Order Number DE95002850. Source: OSTI; NTIS; INIS; GPO Dep.

This is the first annual report for developing an advanced integrated in situ UHV growth/analysis system for synchrotron radiation studies of interface and surface reactions which lead to epitaxial structures on Si, Ge, and $Si_{1-x}Ge_x$ alloys. This equipment will allow one to use techniques based on synchrotron radiation, such as photoemission, x-ray standing wave (XSW), and surface x-ray absorption spectroscopy (SXAFS) to determining the electronic states and atomic configurations of surfaces in metal-silicon, metal-germanium and metal-silicon-germanium alloys. Since the award of the contract the authors have completed a detailed design of the overall system, identified commercially available equipment which fits the requirements and have purchased or ordered all of this equipment. They have also custom designed a considerable amount of equipment which is not available commercially because of the special requirements. This includes both of the UHV chambers, sample manipulators, and a mobile support stand. In this report, they will describe the design and purchase status of the system. An overview of the equipment purchase status is given in Appendix 1. The details of their custom designed growth and analytical chambers are given in Appendix 2.

2313 (FZR–36) **Forschungszentrum Rossendorf, Institut fuer Ionenstrahlphysik und Materialforschung. Annual report 1993.** Moeller, W. (ed.); Wieser, E. (ed.); Kirch, S. (ed.). Forschungszentrum Rossendorf e.V. (FZR) (Germany). Inst. fuer Ionenstrahlphysik und Materialforschung. Apr 1994. 78p. Order Number DE95716126. Source: OSTI; NTIS (US Sales Only); INIS.

Highlights were: Ion beam induced epitaxial crystallization of 6H-SiC - Band gap engineering in Co alloyed β-$FeSi_2$ formed by ion beam synthesis - Formation of $CoSi_2$ wires by maskless implantation with the focused ion beam - Phosphorus implanted n^+-layers for HPGe - Development of a fluidic ISFET microsystem for chemical analysis - Depth selective Moessbauer spectroscopy of Al-implanted iron - Plasma source ion implantation - Simultaneous light element analysis by HIERD for plasma-wall interaction studies in fusion research - Paint layer studies using PIXE on air - Texture investigation on geological three phase samples - status of the Rossendorf 7.25 GHz ECR ion source - Formation of double-height Si(001) steps by sputtering with Xe ions - a computer simulation - Self-organisation during Ostwald ripening in ion beam synthesis of buried compound layers - Modification of metals and other materials - Modification of semiconductors and patterning by focused ion beam - Application of ion beams to sensors - Ion beam analysis, fundamentals of ion-solid-interaction and accelerator technique - Structural research. (orig./HP)

2314 (INIS-JP–024, pp. A850/1-A850/12) **Sub-half-micrometer device fabrication with synchrotron based X-ray lithography.** Suzuki, Katsumi (NEC Corp., Tukuba, Ibaraki (Japan). Microelectronics Research Labs.). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

This article describes the state of the art of X-ray lithography, which is one of the most attractive application of synchrotron to industry. Some important considerations for development of an industrially useful X-ray lithography technology has been described. MOS FETs with 0.3 μm gates were fabricated using a compact synchrotron-based X-ray lithography at four mask levels. The results showed high resolution and large process-latitude of the X-ray lithography. Further improvement in overlay accuracy will enable us to fabricate ULSIs with minimum line-width below 0.3 μm. (author).

2315 (INIS-mf–14386, pp. WM06) **Time-dependent atomic displacements in solid state diffusion.** Baker, J.B.H. (New England Univ., Armidale, NSW (Australia). Dept. of Physics); Girard, C.J.; Sholl, C.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. ATOMIC DISPLACEMENTS/spin-lattice relaxation; ATOMIC DISPLACEMENTS/temperature dependence; CRYSTAL DEFECTS/atomic displacements; DIFFUSION; DOPED MATERIALS; FOURIER TRANSFORMATION; VACANCIES

2316 (INIS-mf–14386, pp. WA01) **The study of transient NMR effects by use of statistical tensor formalism.** Shakhmuratova, L.N. (Kazan State Pedagocical Inst., Kazan (Russian Federation)). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. ORIENTED NUCLEI/gamma radiation; ORIENTED NUCLEI/nuclear magnetic resonance; ANGULAR DISTRIBUTION; MAGNETIC DIPOLES; PERTURBED ANGULAR CORRELATION; QUADRUPOLE MOMENTS; SPIN ECHO; TENSORS; TRANSIENTS

2317 (INIS-mf–14386, pp. TM01) **Unexpected observations in metals at very low temperatures.** Eska, G. (Bayreuth Univ. (Germany)). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. METALS/nuclear magnetic resonance; METALS/spin orientation; ACOUSTIC MEASUREMENTS; METALS; SPIN ECHO; TEMPERATURE RANGE 0065-0273 K

2318 (INIS-mf–14386, pp. WP11) **Mechanochemical transformation of hematite to magnetite: structural changes.** Campbell, S.J. (Univ. of NSW, Australian Defence Force Academy, Canberra, ACT (Australia). Dept. of Physics); Wang, G.; Kaczmarek, W.A.; Onyszkiewicz, I. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. HEMATITE/milling; MAGNETITE/moessbauer effect; ACTIVATION ANALYSIS; CRYSTAL STRUCTURE; CRYSTAL-PHASE TRANSFORMATIONS; HEMATITE; MILLING; HIGH PRESSURE; MAGNETITE; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE RANGE; TIME DEPENDENCE; X-RAY DIFFRACTION

2319 (INIS-mf–14386, pp. WP17) **Transient NMRON - recent advances.** Hutchinson, W.D. (Univ. of New South Wales, Australian Defence Force Academy, Canberra, ACT (Australia). Dept. of Physics); Jaaatinen, E.; Yazidjoglou, N.; Chaplin, D.H. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. ORIENTED NUCLEI/nuclear magnetic resonance; ORIENTED NUCLEI/spin-lattice relaxation; COBALT 60; GAMMA SPECTROSCOPY; IRON ALLOYS; PULSES; SPIN ECHO; SPIN-SPIN RELAXATION

2320 (INIS-mf–14386, pp. WP37) **A practical application of the theory of hyper-complex variables: dielectric and optical response of 3-dimensional arrays of spheres of complex permittivity.** Vagov, A.V. (Australian National Univ., Canberra, ACT (Australia). Research School of Physical Sciences); Raschik, A.; Smith, G.B. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ALUMINIUM/crystal structure; ALUMINIUM/permittivity; PERMITTIVITY/laplace equation; ALUMINIUM; PERMITTIVITY; ANALYTICAL SOLUTION; OPTICAL PROPERTIES; SPHERES; THREE-DIMENSIONAL CALCULATIONS

2321 (INIS-mf–14386, pp. WP46) **High energy photoelectron diffraction data from GaAs surfaces.** Bocquet, A.E. (La Trobe Univ., Bundoora, VIC (Australia). Dept. of Physics); Leckey, R.C.C.; Riley, J.D.; Denecke, R.; Eckstein, R.; Ley, L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. GALLIUM ARSENIDES/photoelectron spectroscopy; PHOTOELECTRON SPECTROSCOPY/holography; HOLOGRAPHY; SURFACES

2322 (INIS-mf–14386, pp. WP47) **Enhanced spin g-factor and split Landau-level for AlGaAs/GaAs heterostructures in strong magnetic fields.** Xu, W. (Australian National Univ., Canberra, ACT (Australia). Research School of Physical Sciences); Das, M.P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb

1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. GALLIUM ARSENIDES/aluminium compounds; GALLIUM ARSENIDES/gyromagnetic ratio; ANALYTICAL SOLUTION; ELECTRON DENSITY; ENERGY-LEVEL TRANSITIONS; GREEN FUNCTION; LANDAU DAMPING; MAGNETIC FIELDS; TEMPERATURE DEPENDENCE

2323 (INIS-mf–14386, pp. WP52) **Porous silicon studies by soft X-ray emission spectroscopy.** Crisp, R.S. (Western Australia Univ., Nedlands, WA (Australia). Dept. of Physics); Haneman, D.; Sabet-Dariani, R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. POROUS MATERIALS/electronic structure; POROUS MATERIALS/emission spectra; SILICON/porous materials; ANNEALING; PHASE TRANSFORMATIONS; PHYSICAL PROPERTIES; SILICON; SILICON OXIDES; SOFT X RADIATION

2324 (INIS-mf–14386, pp. WP53) **Lattice relaxation in stained layer semiconductors studied by in situ X-ray topography during MBE growth.** Usher, B.F. (Telecom Australia Research Laboratoires, Clayton, VIC (Australia)); Barnett, S.J.; Whitehouse, C.R.; Johnson, A.D.; Keir, A.M.; Cullis, A.G.; Clark, G.F.; Tanner, B.K.; Spirkl, W.; Lunn, B.; Hogg, J.C.H.; Hagston, W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SEMICONDUCTOR MATERIALS/spin-lattice relaxation; SPIN-LATTICE RELAXATION/x-ray radiography; CRYSTAL DEFECTS; CRYSTAL GROWTH; FRACTOGRAPHY; STRAINS

2325 (INIS-mf–14386, pp. WP54) **Empirical molecular dynamics calculations for the (001) and (111) reconstructed surfaces of diamond.** Dyson, A.J. (Newcastle Univ., NSW (Australia). Dept. of Physics); Smith, P.V. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. DIAMONDS/surface properties; SURFACE PROPERTIES/thermodynamic molecular model; CARBON; COMPUTERIZED SIMULATION; CRYSTAL STRUCTURE; DIAMONDS; DIMERS; ENERGY DEPOSITION; POTENTIAL ENERGY

2326 (INIS-mf–14386, pp. WP59) **Electrically detected magnetic resonance from a silicon p-n junction diode.** Xiong, Z. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Miller, D.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SILICON DIODES/electron spin resonance; SILICON DIODES/p-n junctions; ELECTRIC CONDUCTIVITY; ENERGY-LEVEL TRANSITIONS; HYPERFINE STRUCTURE; MAGNETIC FIELDS; MAGNETIC RESONANCE; MICROWAVE RADIATION; TEMPERATURE RANGE 0273-0400 K

2327 (INIS-mf–14386, pp. WP64) **Scanning deep level transient spectroscopy using an MeV ion microprobe.** Laird, J.S. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Bardos, R.A.; Moloney, G.R.; Saint, A.; Legge, G.J.F. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SEMICONDUCTOR MATERIALS/ion microprobe analysis; SEMICONDUCTOR MATERIALS/ion spectroscopy; CRYSTAL DEFECTS; DATA ACQUISITION; ELECTRICAL TRANSIENTS; IMPURITIES; MEASURING METHODS; MEV RANGE; STRUCTURAL CHEMICAL ANALYSIS

2328 (INIS-mf–14386, pp. WP66) **Channeling contrast microscopy of defects in type II-VI MSM photodetectors.** Witham, L.C. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Jamieson, D.N. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CRYSTAL DEFECTS/ion microprobe analysis; CADMIUM TELLURIDES; CHANNELING; MERCURY TELLURIDES; PHOTODETECTORS; STRUCTURAL CHEMICAL ANALYSIS

2329 (INIS-mf–14386, pp. WP67) **In-situ control of solids oxidation.** Skryabin, I.L. (University of Technology, Sydney, NSW (Australia)); Bell, J.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 fig. GRAPHITE/electrochemical coating; GRAPHITE/oxidation; OXIDATION/gas analysis; GRAPHITE; OXIDATION; PUMPS; TEMPERATURE DEPENDENCE

2330 (INIS-mf–14386, pp. WP72) **Analysis of compound semiconductor materials using heavy ion recoil spectrometry.** Walker, S.R. (Royal Melbourne Institute of Technology, Melbourne, VIC (Australia). Dep. of Physics); Johnston, P.N.; Bubb, I.F.; Studd, W.; Cohen, D.D.; Dytlewski, N.; Hult, M.; Whitlow, H.J.; Zahring, C.; Oestling, M.; Andersson, M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HEAVY ION SPECTROMETERS/time-of-flight method; SEMICONDUCTOR MATERIALS/heavy ion spectrometers; IMPURITIES; IODINE 127 BEAMS; MAGNETIC SPECTROMETERS; MEASURING METHODS; MEV RANGE 10-100; RECOILS; RUTHERFORD SCATTERING; SECONDARY EMISSION; SPATIAL DISTRIBUTION

2331 (INIS-mf–14386, pp. WP74) **New automatic RBS/channeling system for thin film material analysis.** Wielunski, L.S. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Kenny, M.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. THIN FILMS/rutherford scattering; COMPUTERIZED CONTROL SYSTEMS; CRYSTAL DEFECTS; DATA ACQUISITION; DATA PROCESSING; H CODES; ION CHANNELING; STRUCTURAL CHEMICAL ANALYSIS

2332 (INIS-mf–14386, pp. TP16) **Accumulated photon echoes in Nd^{3+}-doped CaF_2 and disordered CaF_2-YF_3 crystals.** Reeves, R.J. (Oklahoma State Univ., Stillwater, OK (United States)); Ver Steeg, H.W.; Karasik, A.Ya.; Power, R.C.; Basiev, T.T. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CALCIUM FLUORIDES/crystal doping; CALCIUM FLUORIDES/stark effect; YTTRIUM FLUORIDES/crystal doping; YTTRIUM FLUORIDES/stark effect; LINE BROADENING; NEODYMIUM IONS; ORDER-DISORDER TRANSFORMATIONS; PHONONS; SPIN-LATTICE RELAXATION; TEMPERATURE DEPENDENCE

2333 (INIS-mf–14386, pp. TP18) **Neutron diffraction measurements of time-dependent transformation of plastically**

deformed Mg-PSZ. Batchelor, W.J. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Finlayson, T.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 4 refs. PHASE TRANSFORMATIONS/neutron diffraction; ZIRCONIUM OXIDES/phase transformations; CUBIC LATTICES; DEFORMATION; MAGNESIUM OXIDES; MONOCLINIC LATTICES; PHASE STUDIES; PLASTICITY; STABILIZED SUPERCONDUCTORS; STRESSES; TETRAGONAL LATTICES; TIME DEPENDENCE

2334 (INIS-mf–14386, pp. TP28) **Inelastic neutron scattering from cubic stabilised zirconia.** Argyriou, D.N. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia)); Elcombe, M.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. CRYSTAL STRUCTURE/neutron diffraction; CRYSTAL STRUCTURE/static loads; ZIRCONIUM OXIDES/crystal structure; BOND LENGTHS; CALCIUM OXIDES; CRYSTAL MODELS; CUBIC LATTICES; INELASTIC SCATTERING; OXYGEN; PHONONS; STABILITY; YTTRIUM OXIDES

2335 (INIS-mf–14386, pp. TP33) **The micro pore structure of concrete determined by small angle neutron scattering.** Sabine, T.M. (Australian Nuclear Science and Technology Organisation, Lucas Heights, NSW (Australia). Advanced Materials Program); Bertram, W.K.; Aldridge, L.P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CONCRETES/microstructure; MICROSTRUCTURE/small angle scattering; CONCRETES; MICROSTRUCTURE; HYDRATION; NEUTRON DIFFRACTION; POROSITY; SIZE

2336 (INIS-mf–14386, pp. TP52) **Oxygen stoichiometry measurements in polycrystalline $YBa_2Cu_3O_{7-x}$ by Micro-Raman spectroscopy.** Long, G.M. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Finlayson, T.R.; Lim, C.S.; Mernagh, T.P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 5 refs. OXYGEN/raman spectroscopy; OXYGEN/stoichiometry; YTTRIUM OXIDES/hyperfine structure; BARIUM OXIDES; COPPER OXIDES; OXYGEN; STOICHIOMETRY; STRUCTURAL CHEMICAL ANALYSIS; TRANSITION TEMPERATURE

2337 (INIS-mf–14386, pp. TP64) **^{197}Au Moessbauer analysis of gold-doped YBCO.** Jinks, D. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Ganakas, G.; Cashion, J.D.; Jakovidis, G.; Morgan, M.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. SUPERCONDUCTING COMPOSITES/crystal structure; SUPERCONDUCTING COMPOSITES/yttrium oxides; YTTRIUM OXIDES/gold additions; YTTRIUM OXIDES/moessbauer effect; BARIUM OXIDES; COORDINATION VALENCES; COPPER OXIDES; DOPED MATERIALS; GOLD 197; OXYGEN; STOICHIOMETRY; STRUCTURAL CHEMICAL ANALYSIS

2338 (INIS-mf–14386, pp. WE04) **Applications of synchrotron radiation to materials science and the Australian National Beamline Facility at the Photon Factory.** Wilkins, S. (Commonwealth Scientific and Industrial Research Organization, Melbourne, VIC (Australia). Div. of Materials Science). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. MATERIALS TESTING/kek photon factory; SYNCHROTRON RADIATION/structural chemical analysis; ADVANCED PHOTON SOURCE; AUSTRALIA; INTERNATIONAL COOPERATION; JAPAN; X RADIATION

2339 (INIS-mf–14393, pp. 38-39) **Chemical bonding and covalency in $NiSO_4 \cdot 6H_2O$ by measurement of charge and spin densities.** Ptasiewicz-Bak, H. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); McIntyre, G.J.; Olovsson, I. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 6 refs., 1 fig. X-RAY DIFFRACTOMETERS/chemical bonds; X-RAY DIFFRACTOMETERS/nickel sulfates; CHARGE DENSITY; HYDRATES; SPIN; TEMPERATURE RANGE 0000-0013 K; TEMPERATURE RANGE 0013-0065 K; TEMPERATURE RANGE 0273-0400 K

2340 (INIS-mf–14393, pp. 90) **Neutron spectroscopy studies of amino-acids.** Pawlukojc, A. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Natkaniec, I. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 1 ref., 1 fig., 1 tab. NEUTRON SPECTROSCOPY/alanines; NEUTRON SPECTROSCOPY/glycine; LATTICE VIBRATIONS; ALANINES; GLYCINE; TEMPERATURE RANGE 0065-0273 K; TEMPERATURE RANGE 0273-0400 K

2341 (SAND–95-8424C) **Enhancements in the Livermore spectrum analysis package PIXEF.** Antolak, A.J. (Sandia National Labs., Livermore, CA (United States)); Hildner, M.L.; Bench, G.S. Sandia National Labs., Livermore, CA (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; W-7405-ENG-48. (CONF-941129–6: Conference on application of accelerators in research and industry, Denton, TX (United States), 7-10 Nov 1994). Order Number DE95002487. Source: OSTI; NTIS; INIS; GPO Dep.

A number of enhancements have been incorporated into the Livermore particle-induced x-ray emission (PIXE) spectral fitting program PIXEF (for PIXE-Fit) in order to improve our quantitative analysis capability for data collected with Si(Li) detectors. Some of the new features include an improved description for the background which takes into account x-ray absorption effects, a better representation of the line shapes using Voigtian distributions, and a better treatment of peak fitting in regions of poor counting statistics. The implementation of these improvements into PIXEF is described.

2342 (UCRL-JC–117613) **Magnetic x-ray circular dichroism in spin-polarized photoelectron diffraction.** Waddill, G.D. (Lawrence Livermore National Lab., CA (United States). Chemistry and Materials Science Dept.); Tobin, J.G.; Guo, X.; Tong, S.Y. Lawrence Livermore National Lab., CA (United States); Wisconsin Univ., Milwaukee, WI (United States). 12 Jul 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48 ; FG02-84ER45076. (CONF-9408131–4: 8. international conference on x-ray absorption fine structure, Berlin (Germany), 28 Aug - 2 sep 1994). Order Number DE95002394. Source: OSTI; NTIS; INIS; GPO Dep.

The first structural determination with spin-polarized, energy-dependent photoelectron diffraction using circularly-polarized x-rays is reported for Fe films on Cu(001). Circularly-polarized x-rays produced spin-polarized photoelectrons from the Fe 2p doublet, and intensity asymmetries in the $2p_{3/2}$ level are observed. Fully spin-specific multiple scattering calculations reproduced the experimentally-determined energy and angular dependences. A new analytical procedure which focuses upon intensity variations due to spin-dependent diffraction is introduced. A sensitivity to local geometric and magnetic structure is demonstrated.

6652 Solid-State Plasma

Refer also to citation(s) 2313

2343 (IC–94/205) **Monte Carlo study of electron-plasmon scattering effects on hot electron transport in GaAs.** Popov, V.V. (International Centre for Theoretical Physics, Trieste (Italy)); Bagaeva, T.Yu.; Solodkaya, T.I. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 19p. Project 93-02-15480. Order Number DE95607768. Source: OSTI; NTIS (US Sales Only); INIS.

It is shown using Monte Carlo simulation that electron-plasmon scattering affects substantially the hot-electron energy distribution function and transport properties in bulk GaAs. However, this effect is found to be much less than that predicted in earlier paper of other authors. (author). 5 refs, 7 figs.

2344 (INIS-mf–14386, pp. WP44) **Quantum well plasma effects in the tunneling current through a semiconductor double barrier structure.** Lerch, M.L.F. (Univ. of Wollongong, Wollongong, NSW (Australia). Dept. of Physics); Zhang, C.; Martin, A.D.; Simmonds, P.E.; Eaves, L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRON GAS/plasma waves; SURFACE BARRIER DETECTORS/tunnel effect; ANALYTICAL SOLUTION; FEYNMAN PATH INTEGRAL; HAMILTONIANS; MAGNETIC FIELDS; QUANTUM ELECTRONICS; SEMICONDUCTOR DETECTORS

2345 (UM-P–93/73) **Surface plasmon observed for carbon nanotubes.** Bursill, L.A. (Ecole Polytechnique Federale, Lausanne (Switzerland)); Stadelmann, P.A.; Peng, J.L.; Prawer, S. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 15p. Sponsored by Australian Research Council, Canberra, ACT (Australia);Swiss National Science Foundation, Bern (Switzerland). Order Number DE95607769. Source: OSTI; NTIS (US Sales Only); INIS.

This paper presents parallel electron energy loss spectra (PEELS) results, obtained for individual carbon nanotubes, using nanoprobe techniques (1-2 nm diameter electron beam), energy resolution 0.5 eV and collection times of 4-25 sec. The aim was to use a nanoprobe to compare PEELS spectra from different parts of a tube, in order to search for variations in sp^2/sp^3 bonding ratios as well as to look for orientation dependent plasmon and core-loss phenomena. It also seemed interesting to compare results for nanotubes with those for other varieties of graphitized carbons. The most interesting result so far was the appearance of a 15 eV plasmon peak, which appeared only for tubes containing $\leq$ about 12 graphite-like layers. This peak did not shift significantly with tube size. A low-loss peaks at 6 eV of variable relative intensity was also observed this peak was relatively very weak for amorphous tubes; it appears to be characteristic of graphite-like layers, as found for nanotubes and, of course, graphite itself. This paper is restricted to discussion of the low-loss results. The experimental techniques are first described, including some details of the methods which may be used to disperse and support sooty carbons for high-resolution transmission electron microscopy. The results are then presented, followed by an interpretation of all the low-loss PEELS results, including those of the other authors. 14 refs., 2 figs.

6653 Interactions Between Beams and Condensed Matter

Refer also to citation(s) 1126, 1128, 1152, 1277, 1289

2346 (ANL/MCS/PP–71694) **On the sputtering of metals and insulators: A nonlinear evolution problem with nonlinear boundary condition.** Zhang, H. (Univ. of Texas, Austin, TX (United States). Dept. of Mathematics). Argonne National Lab., IL (United States). [1994]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001456. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper the author considers a nonlinear evolution problem denoted in the paper as P. Problem (P) arises in the study of thermal evaporation of atoms and molecules from locally heated surface regions (spikes) invoked as one of several mechanisms of ion-bombardment-induced particle emission (sputtering). Then in the case of particle-induced evaporation, the Stefan-Boltzman law of heat loss by radiation is replaced by some activation law describing the loss of heat by evaporation. The equation in P is the so-called degenerate diffusion problem, which has been extensively studied in recent years. However, when dealing with the nonlinear flux boundary condition, $\beta(\cdot)$ is usually assumed to be monotene. The purpose of this paper is to provide a general theory for problem P under a different assumption on $\beta(\cdot)$, i.e., Lipschitz continuity instead of monotonicity. The main idea of the proof used here is to choose an appropriate test function from the corresponding linearized dual space of the solution. The similar idea has been used by many authors, e.g., Aronson, Crandall and Peletier, Bertsch and Hilhorst and Friedman. The author follows the proof of Bertsch and Hilhorst. The paper is organized as follows. They begin by stating the precise assumptions on the functions involved in P and by defining a weak solution. Then, in Section 2 they prove the existence of the solution by the method of parabolic regularization. The uniqueness is proved in Section 3. Finally, they study the large time behavior of the solution in Section 4.

2347 (CONF-9408150–2) **Angular and charge state distributions of highly charged ions scattered during low energy surface-channeling interactions with Au(110).** Meyer, F.W.; Folkerts, L.; Schippers, S. Oak Ridge National Lab., TN (United States). [1994]. 18p. Sponsored by USDOE, Washington, DC (United States);Oak Ridge Inst. for Science and Education, TN (United States);Deutsche Forschungsgemeinschaft, Bonn (Germany). DOE Contract AC05-84OR21400. From 10. international workshop of inelastic ion-surface collisions; Grand Targhee Resort, WY (United States); 8-12 Aug 1994. Order Number DE95001348. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have measured scattered projectile angular and charge state distributions for 3.75 keV/amu O^{q+} ($3 \leq q \leq 8$) and 1.2 keV/amu Ar^{1+} ($3 \leq q \leq 14$) ions grazingly incident along the [110] and [100] directions of a Au(110) single crystal target. Scattered projectile angular distribution characteristic of surface channeling are observed. For both incident species, the dominant scattered charge fraction is neutral, which varies only by a few percent as a function of incident charge state. Significant O^- formation is observed, which manifests a distinct velocity threshold. For incident Ar projectiles with open L-shells, the positive scattered charge fractions, while always less than about 10%, increase linearly with increasing number of initial L-shell vacancies.

2348 (INIS-JP–024, pp. B720/1-B720/3) **Ion beam technology for nanostructure and interface engineering.** Noda, Shoji (Toyota Central Research and Development Labs., Inc., Nagakute, Aichi (Japan)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (In Japanese). (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

'Nanostructure and Interface' Engineering is one of the leading concepts to make new functional materials. In materials of nanostructure or nanophase materials, quantum size effects may appear, and surface and interface often play dominant roles in determining materials properties. Exotic properties and dramatic improvements of bulk properties are expected to result from nanostructure and interface engineering. Ion beam can be used for nanophase materials processing (ion implantation, ion beam mixing, —) and characterization (ion scattering analysis). Several features of ion beam technology (ion beam processing and ion scattering analysis) are reported in connection with nanostructure and interface engineering. (author).

2349 (INIS-mf–14386, pp. WA03) **Cross sectional imaging of single crystal materials by ion beam analysis.** Jamieson, D.N. (Melbourne Univ., Parkville, VIC (Australia). School of

Physics). [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CRYSTAL STRUCTURE/rutherford scattering; ION IMPLANTATION/ion scattering analysis; ION IMPLANTATION/tomography; ARSENIC; CADMIUM TELLURIDES; CARBON; EXPERIMENTAL DATA; TOMOGRAPHY; MERCURY COMPOUNDS; RESOLUTION

2350 (INIS-mf–14386, pp. WP31) **Molecular dynamics simulation of ion impact phenomena in 3 D nickel lattice.** Guan, P. (Sydney Univ., NSW (Australia). School of Physics); Marks, N.A.; Mckenzie, D.R.; Pailthrope, B.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. ATOM-ATOM COLLISIONS/energy losses; ATOM-ATOM COLLISIONS/thermodynamic molecular model; NICKEL/atom-atom collisions; NICKEL/fcc lattices; ALGORITHMS; COMPUTERIZED SIMULATION; IMPACT PARAMETER; NICKEL; THIN FILMS; THREE-DIMENSIONAL CALCULATIONS

2351 (INIS-mf–14386, pp. WP38) **Tracer correlation factor and atomic displacements in solid state diffusion.** Stephenson, P.C.L. (New England Univ., Armidale, NSW (Australia). Dept. of Physics); Sholl, C.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. ATOMIC DISPLACEMENTS/correlation functions; CRYSTAL DEFECTS/atomic displacements; ANALYTICAL SOLUTION; COMPUTERIZED SIMULATION; DIFFUSION; DOPED MATERIALS; TRACE AMOUNTS; VACANCIES

2352 (INIS-mf–14386, pp. WP42) **Monte Carlo simulation of nanodomain textures in relaxor-type lead scandium tantalate.** Qian, H. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Peng, J.L.; Bursill, L.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. CRYSTAL STRUCTURE/ising model; CRYSTAL STRUCTURE/monte carlo method; SCANDIUM COMPLEXES/crystal structure; SCANDIUM COMPLEXES/tantalates; CRYSTAL DEFECTS; DIELECTRIC PROPERTIES; FREQUENCY DEPENDENCE; PERMITTIVITY; TANTALATES; TEMPERATURE DEPENDENCE

2353 (INIS-mf–14386, pp. WP56) **Memory switching and quantum effects in amorphous hydrogenated silicon.** Jafar, M. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Haneman, D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. SILICON/schottky barrier diodes; SILICON/switches; VANADIUM/diffusion; VANADIUM/schottky barrier diodes; AMORPHOUS STATE; AUGER ELECTRON SPECTROSCOPY; DIFFUSION LENGTH; ELECTRODES; SILICON; SWITCHES; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE RANGE 1000-4000 K; VANADIUM; DIFFUSION

2354 (INIS-mf–14386, pp. TP15) **Molecular dynamic study of compressive stress generation.** Marks, N.A. (Sydney Univ., NSW (Australia). School of Physics); McKenzie, D.R.; Pailthorpe, B.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. CRYSTAL GROWTH/energy dependence; CRYSTAL GROWTH/ion beams; THIN FILMS/mechanical properties; CHEMICAL BONDS; COMPUTERIZED SIMULATION; DENSITY; EV RANGE 01-10; EV RANGE 10-100; PHYSICAL RADIATION EFFECTS; STRESSES; TWO-DIMENSIONAL CALCULATIONS

2355 (INIS-mf–14386, pp. TP30) **Transverse microanalysis of 2.5 MeV H^+ damage in diamond.** Dooley, S.P. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Jamieson, D.N.; Nugent, K.W.; Prawer, S. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 fig. CHANNELING/physical radiation effects; CHANNELING/raman spectroscopy; DIAMONDS/channeling; CHANNELING; DIAMONDS; EXPERIMENTAL DATA; ION IMPLANTATION; ORDER-DISORDER TRANSFORMATIONS; PROTON BEAMS; RAMAN SPECTRA; RUTHERFORD SCATTERING

2356 (INIS-mf–14393, pp. 20) **Implantation induced amorphization in Si, GaAs, and GaAsP.** Rzewuski, H. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Krynicki, J.; Warchol, S.; Zieborak, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. ION IMPLANTATION/physical radiation effects; ION IMPLANTATION/semiconductor materials; ARGON 40 BEAMS; CRYSTALS; GALLIUM ARSENIDES; GALLIUM PHOSPHIDES; PHOSPHORUS 31 BEAMS; SILICON

2357 (INIS-mf–14393, pp. 89-90) **The wide-range X-ray scattering of structural changes in PETP occurring under heavy ions irradiation.** Ciesla, K. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Trautmann, Ch. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 2 refs., 2 figs. ION BEAMS/foils; ION BEAMS/irradiation; X-RAY DIFFRACTION/foils; DYSPROSIUM IONS; FOILS; IRRADIATION; POLYESTERS; UNILAC

2358 (INIS-mf–14393, pp. 90-92) **CEMS studies of phase transformation in the surface layer of SW12C steel after nitrogen implantation.** Starosta, W. (Institute of Nuclear Chemistry and Technology, Warsaw (Poland)); Korycki, J. Institute of Nuclear Chemistry and Technology, Warsaw (Poland). [1993]. 128p. In *Annual report 1992.* Order Number DE95605569. Source: OSTI; NTIS; INIS.

Short communication. 3 figs. ION IMPLANTATION/moessbauer effect; ION IMPLANTATION/phase transformations; ION IMPLANTATION/steels; STEELS; NITROGEN 14 BEAMS; SURFACE TREATMENTS

2359 (IPNO-DRE–93-25) **Non-linear sputtering effects induced by MeV energy gold clusters.** Boussofiane-Baudin, K. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Brunelle, A.; Chaurand, P.; Della-Negra, S.; Depauw, J.; Le Beyec, Y.; Hakansson, P. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Sep 1993. [22p.] (CONF-9306316–: Conference on polyatomic ion impact on solids and related phenomena, Saint-Malo (France), 6-10 Jun 1993). Order Number DE95607772. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Nuclear Instruments and Methods (NL), Section B.

Gold clusters Au_n^+ with $1 < n \leq 4$, accelerated to MeV energies at the Orsay tandem accelerator, have been used to induce secondary ion emission from the surface of thin organic and inorganic films. A non-linear enhancement of the secondary ion yields is observed when cluster impacts are compared to single atom impacts at the same velocity. It has been shown that the collective effects propagate in the solid over a depth larger than 2000 A. The equilibrium charge state of cluster constituents after their passage through a thin carbon foil (1000 A) has been measured. The mean value for the cluster constituents is the same as for single atoms at the same velocity. (authors). 41 refs., 8 figs., 1 tab.

2360 (UM-P–92/77) **Conductivity in insulators due to implantation of conducting species.** Prawer, S. (Melbourne Univ., Parkville, VIC (Australia). School of Physics); Hoffman, A.; Petravic, M.; Kalish, R. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 19p. Sponsored by Department of Industry, Technology and Commerce, Canberra, ACT (Australia). Order Number DE95607773. Source: OSTI; NTIS (US Sales Only); INIS.

Control of the surface conductivity of insulators can be accomplished by high dose ion implantation of conductive species. The use of C^+ as the implant species is particularly interesting because C can either form electrically insulating sp^3 bonds or electrically conducting sp^2 bonds. In the present work, fused quartz plates have been irradiated with 100 keV C^+ ions to doses up to 1×10^{17} ions/cm^2 at room temperature and at 200 deg C. The ion beam induced conductivity was monitored in-situ and was found to increase by up to 8 orders to magnitude for the ion dose range studied. Xe implantations over a similar range did not induce any changes in the conductivity showing that the increase in conductivity is caused by the presence of the C in the fused quartz matrix and not by damage. The dependence of the conductivity on implantation temperature and on post implantation annealing sheds light on the clustering of the C implants. The temperature dependence of the conductivity for the highest doses employed (1×10^{17} C^+/cm^2) can be described very well by $\ln\sigma \propto T$. This is considered to be a peculiar dependence which does not comply with any of the standard models for conduction. 9 refs., 1 tab., 6 figs.

6654 Quantum Physics Aspects of Condensed Matter

2361 (IC–94/139) **Rotational melting in displacive quantum paraelectrics.** Martonak, R.; Tosatti, E. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 43p. Order Number DE95607804. Source: OSTI; NTIS (US Sales Only); INIS.

Displacive quantum paraelectrics are discussed as possible realizations of rotational quantum melting. The phenomenology of $SrTiO_3$ and $KTaO_3$ is discussed in this light. Both old and fresh theoretical work on two-dimensional lattice models for quantum paraelectricity is reviewed. (author). 73 refs, 15 figs.

2362 (IC–94/183) **Analytic formulae for the Hartree-Fock order parameter at arbitrary p/q filling factors for the 2DEG in a magnetic field.** Cabo Monte Oca, A. de. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 15p. Order Number DE95607805. Source: OSTI; NTIS (US Sales Only); INIS.

Analytic expressions for order parameters are given for the previously introduced general class of Hartree Fock states at arbitrary filling factors ν=p/q for odd q values. The order parameters are expressed as sums of magnetic translations eigenvalues over the filled single electron states. Simple summation formulae for the band spectra in terms of the same eigenvalues are also presented. The energy per particle at ν=1/3 is calculated for various states differing in the way of filling of the 1/3 of the orbitals. The calculated energies are not competing with the usual CDW results. However the high degree of electron overlapping allows for the next corrections to modify this situation. The discussion suggests these Hartree-Fock Slater determinants as interesting alternatives for the Tao-Thouless parent states which may correct their anomalous symmetry and correlation functions properties. (author). 28 refs.

2363 (IPNO-TH–93-24) **Shell structure in faceted metal clusters.** Pavloff, N. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Creagh, S.C. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 1993. 23p. Order Number DE95607806. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review, B (US).

The quantized electronic energy levels are studied in a 3D icosahedral billiard modelling a faceted metal cluster. The first 2000 levels are determined numerically. The magic numbers are compared with experimental data and with the result for a spherical model. The supershell structure is discussed and its study is proposed as a test of cluster sphericity. The relevance of diffractive effects in the semi-classical study of the model is pointed out. (authors). 26 refs., 5 figs., 2 tabs.

665410 Superconductivity

Refer also to citation(s) 924, 1183, 1200, 1208, 1217, 1218, 1268, 1554, 2432, 2433

2364 (IC–94/133) **Condensate localization by mesoscale disorder in high-T_c superconductors.** Kumar, N. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 7p. Order Number DE95607819. Source: OSTI; NTIS (US Sales Only); INIS.

We propose and solve approximately a phenomenological model for Anderson localization of the macroscopic wavefunction for an inhomogeneous superconductor quench-disordered on the mesoscale of the order of the coherence length ξ_0. Our treatment is based on the non-linear Schroedinger equation resulting from the Ginzburg-Landau free-energy functional having a spatially random coefficient representing spatial disorder of the pairing interaction. Linearization of the equation, valid close to the critical temperature T_c, or to the upper critical field H_{c2} (T_c) maps it to the Anderson localization problem with T_c identified with the mobility edge. For the highly anisotropic high-T_c materials and thin (2D) films in the quantum Hall geometry, we predict windows of re-entrant superconductivity centered at integrally spaced temperature values. Our model treatment also provides a possible explanation for the critical current $J_{c\ \text{perpendicular}}$ becoming non-zero on cooling before $J_{c\ \text{parallel}}$ does in some high-T_c superconductors. (author). 18 refs.

2365 (IC–94/159) **Coherent state path-integral representation of supersymmetric lattice models.** Zhe Chang. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 31p. Order Number DE95607820. Source: OSTI; NTIS (US Sales Only); INIS.

A kind of high temperature superconductivity related lattice model is investigated within the framework of supergroup coherent state path-integral representation. Symmetry properties are analyzed and the Hamiltonians are written in the symmetric form explicitly in terms of generators of the supergroup U(N/M). By a standard approach, general supergroup coherent states are constructed. Holstein-Primakoff realizations of the supergroup U(N/M) on the coset space U(N/M)/U(1) x U(N-1/M) are obtained. Vacuum persistence amplitudes are expressed in terms of parameters on the coset space U(2/M)/U(1) x U(1/M). Symmetry-breaking terms in the Hamiltonian are taken into account separately. The Lagrangians of these models are quadratic in Grassmann variables. Thus fermionic fields can be integrated out. Nonlinear σ model is arrived at as effective continuum field theory describing the low energy excitations of the supersymmetric lattice models. (author). 45 refs.

2366 (INIS-mf–14386, pp. TM05) **The hole-hole superconducting pairing in the t-J model induced by long-range spin-wave exchange.** Flambaum, V.V. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Kuchiev, M.Yu.; Sushkov, O.P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. HIGH-TC SUPERCONDUCTORS/particle-hole model; PARTICLE-HOLE MODEL/coupling constants; PARTICLE-HOLE MODEL/spin waves; ANTIFERROMAGNETISM; ENERGY GAP; HOLE MOBILITY; INTERACTIONS; MAGNONS; PAIRING ENERGY; TWO-DIMENSIONAL CALCULATIONS

2367 (INIS-mf–14386, pp. FM03) **Charge density wave and Wigner crystal instabilities in electron-hole systems.** Szymanski, J. (Telecom Australia Research lab., Clayton, VIC (Australia)); Swierkowski, L.; Neilson, D. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. ELECTRON-HOLE COUPLING/charge density; SUPERCONDUCTORS/electron-hole coupling; CORRELATION FUNCTIONS; CRYSTAL MODELS; ENERGY GAP; GROUND STATES; INSTABILITY; PAIRING INTERACTIONS; POLARIZATION; SUPERCONDUCTORS; WIGNER EFFECT

2368 (INIS-mf–14386, pp. WP51) **States above a quantum well in tilted magnetic fields.** Miller, D.J. (New South Wales Univ.,

Kensington, NSW (Australia). School of Physics); Xiong, Z. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. ENERGY LEVELS/lorentz force; ENERGY LEVELS/magnetic fields; SUPERLATTICES/energy levels; ELECTRON GAS; QUANTUM ELECTRONICS; SEMICLASSICAL APPROXIMATION; SUPERLATTICES

2369 (INIS-mf–14386, pp. TP35) **Long-range two-hole bound states in the t-J model.** Kuchiev, M.Yu. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Sushkov, O.P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. CRYSTAL MODELS/bound state; HIGH-TC SUPERCONDUCTORS/crystal models; ANTIFERROMAGNETIC MATERIALS; BINDING ENERGY; HOLES; PAIRING INTERACTIONS; SUPERCONDUCTIVITY; TWO-DIMENSIONAL CALCULATIONS; WAVE FUNCTIONS

2370 (INIS-mf–14386, pp. TP41) **Theory of freezing of a flux lattice in high T_c superconductors.** Jackson, D.J.C. (Australian National Univ., Canberra, ACT (Australia). Dept. of Theoretical Physics); Das, M.P. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/freezing; HIGH-TC SUPERCONDUCTORS/magnetic flux; ELECTRIC CONDUCTIVITY; FREEZING; OXIDES; PHASE TRANSFORMATIONS; SUPERCONDUCTIVITY; TEMPERATURE DEPENDENCE; VORTICES

2371 (INIS-mf–14386, pp. TP43) **Magnetization studies of superconducting V_3 Si.** Lowe, D.B. (Monash Univ., Clayton, VIC (Australia). Dept. of Physics); Finlayson, T.R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. VANADIUM SILICIDES/magnetization; HIGH-TC SUPERCONDUCTORS; HYSTERESIS; MAGNETIC FLUX; SPIN-LATTICE RELAXATION; SQUID DEVICES; MAGNETIZATION

2372 (INIS-mf–14386, pp. TP45) **Thermoelectric power of YBCO: Ag composite superconductors.** Sujito (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Anderson, A.R.; Russell, G.J.; Godammanne, G. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/thermoelectric properties; THERMOELECTRIC PROPERTIES/seebeck effect; THERMOELECTRIC PROPERTIES/silver additions; BARIUM OXIDES; COPPER OXIDES; MAGNETIC SUSCEPTIBILITY; STRUCTURAL CHEMICAL ANALYSIS; TEMPERATURE RANGE 0065-0273 K; X-RAY DIFFRACTION; YTTRIUM OXIDES

2373 (INIS-mf–14386, pp. TP46) **Activation energy of oxygen deficient YBCO.** Sun, H.B. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Russell, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SUPERCONDUCTING COMPOSITES/activation energy; BARIUM OXIDES; COPPER OXIDES; CURRENT DENSITY; ELECTRIC CONDUCTIVITY; MAGNETIC FLUX; OXYGEN; SPIN-LATTICE RELAXATION; TEMPERATURE DEPENDENCE; THERMOELECTRIC PROPERTIES; YTTRIUM OXIDES

2374 (INIS-mf–14386, pp. TP47) **Electromagnetic response of high-Tc thick films.** Cochrane, J.W. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Russell, G.J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTROMAGNETISM/temperature dependence; HIGH-TC SUPERCONDUCTORS/electromagnetism; HIGH-TC SUPERCONDUCTORS/zirconium oxides; BARIUM OXIDES; COPPER OXIDES; ELECTROMAGNETISM; FILMS; GHZ RANGE; KHZ RANGE; MHZ RANGE; PENETRATION DEPTH; YTTRIUM OXIDES

2375 (INIS-mf–14386, pp. TP48) **Anomalous time-decay in neutron depolarization by high-Tc superconductors.** Miles, P.A. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Russell, G.J.; Wang, J.; Gu, G.D.; Kennedy, S.J.; Taylor, K.N.R.; Takamura, K.; Koshizuka, N. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/depolarization; HIGH-TC SUPERCONDUCTORS/magnetic flux; NEUTRON BEAMS/depolarization; BARIUM OXIDES; COPPER OXIDES; DEPOLARIZATION; POLARIZED BEAMS; TEMPERATURE DEPENDENCE; TEMPERATURE RANGE 0013-0065 K; YTTRIUM OXIDES

2376 (INIS-mf–14386, pp. TP57) **Electron paramagnetic resonance, magnetic susceptibility and resistance measurements on Mn doped 1:2:3 high temperatures superconductors.** Bowden, G.J. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); La Robina, M.; Ploenjes, E.C. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/electron spin resonance; HIGH-TC SUPERCONDUCTORS/magnetic susceptibility; HIGH-TC SUPERCONDUCTORS/manganese additions; COPPER OXIDES; DOPED MATERIALS; GADOLINIUM ADDITIONS; GHZ RANGE 01-100; SUPERCONDUCTIVITY; TEMPERATURE RANGE 0065-0273 K

2377 (INIS-mf–14386, pp. TP61) **Spin gap behaviour of YBe_2 $(Cu_{1-x}$ $Zn_x)_4$ O_8.** Williams, G.V.M. (New Zealand Institute for Industrial Research and Development, Lower Hutt (New Zealand)); Tallon, J.L.; Meinhold, R. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. HIGH-TC SUPERCONDUCTORS/magnetic susceptibility; HIGH-TC SUPERCONDUCTORS/nuclear magnetic resonance; HIGH-TC SUPERCONDUCTORS/spin; ANTIFERROMAGNETISM; BARIUM OXIDES; COPPER OXIDES; SPIN; TRANSITION TEMPERATURE; YTTRIUM OXIDES; ZINC OXIDES

2378 (INIS-mf–14386, pp. TP68) **Josephson behaviour and flux trapping effects in YBCO step edge junctions.** Foley, C.P. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Sloggett, G.J.; Matthews, D.N.; Muller, K.H.; Lam, S.; Savvides, N.; Katsaros, A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 1 ref. BARIUM OXIDES/superconductivity; HIGH-TC SUPERCONDUCTORS/hysteresis; HIGH-TC SUPERCONDUCTORS/josephson junctions; SUPERCONDUCTIVITY; COPPER OXIDES; CRITICAL CURRENT; CRITICAL FIELD; HYSTERESIS; MAGNESIUM OXIDES; MAGNETIC FLUX; YTTRIUM OXIDES

2379 (INIS-mf–14386, pp. TP70) **Anomalous flux pinning by twin boundaries in single-crystalline $YBa_2Cu_3O_7$.** Li, J.N. (Amsterdam Univ. (Netherlands). Van der Waals Lab.); Menovsky, A.A.; Franse, J.J.M. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. HIGH-TC SUPERCONDUCTORS/magnetic flux; HIGH-TC SUPERCONDUCTORS/twinning; BARIUM OXIDES; COPPER OXIDES; ELECTRIC CONDUCTIVITY; GRAIN BOUNDARIES; TWINNING; MONOCRYSTALS; YTTRIUM OXIDES

2380 (INIS-mf–14386, pp. WP19) **Faraday magnetometer for studying interstitially modified ferromagnets.** Blach, T.P. (Griffith Univ., Brisbane, QLD (Australia). School of Science); Gray, E.M.A. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. FERROMAGNETIC MATERIALS/magnetic moments; MAGNETOMETERS/faraday method; MAGNETOMETERS/ferromagnetic materials; DESIGN; FABRICATION; IRON ALLOYS; MAGNETOMETERS; NEODYMIUM ALLOYS; NITRIDES; PERMANENT MAGNETS; SAMARIUM ALLOYS; TEMPERATURE RANGE

2381 (INIS-mf–14386, pp. TP37) **Strain tolerant multifilamentary Bi Pb-2223 tapes for power applications.** Yau, J. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Savvides, N.; Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SUPERCONDUCTING FILMS/critical current; SUPERCONDUCTING FILMS/strains; BENDING; BISMUTH COMPOUNDS; CURRENT DENSITY; LEAD COMPOUNDS; SHEETS; SILVER; STRAINS; TEMPERATURE RANGE 0013-0065 K

2382 (INIS-mf–14386, pp. TP42) **Current-carrying length scale in silver sheathed Bi-Pb-Sr-Ca-Cu-O tapes.** Muller, K.H. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Andrikidis, C.; Liu, H.K.; Dou, S.X. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SUPERCONDUCTING FILMS/magnetization; TYPE-II SUPERCONDUCTORS/superconducting films; BENDING; BISMUTH OXIDES; CALCIUM OXIDES; CLADDING; CRITICAL CURRENT; LEAD OXIDES; MAGNETIC FLUX; SQUID DEVICES; STRAINS; STRONTIUM OXIDES; MAGNETIZATION

2383 (INIS-mf–14386, pp. TP67) **Noise in high-T_c r.f. squids.** Sloggett, G.J. (Commonwealth Scientific and Industrial Research Organization, Lindfield, NSW (Australia). Div. of Applied Physics); Foley, C.P.; Binks, R.A.; Savvides, N.; Katsaros, A.; Dart, D.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 3 refs. HIGH-TC SUPERCONDUCTORS/squid devices; SQUID DEVICES/noise; BARIUM OXIDES; COPPER OXIDES; JOSEPHSON JUNCTIONS; MAGNESIUM OXIDES; MHZ RANGE 100-1000; RF SYSTEMS; NOISE; TEMPERATURE RANGE 0065-0273 K; THIN FILMS; YTTRIUM OXIDES

2384 (IS-M–797) **Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal.** Khaykovich, B. (Weizmann Institute of Science, Rehovot (Israel)); Zeldov, E.; Majer, D.; Konczykowski, M.; Larkin, A.I.; Clem, J.R. Iowa State Univ. of Science and Technology, Ames, IA (United States). [1994]. 3p. Sponsored by USDOE, Washington, DC (United States);Ministry of Science and the Arts (Israel);Klutznick (Philip M.) Fund;France-Israel Cooperation Program;MINERVA Foundation. DOE Contract W-7405-ENG-82. (CONF-940701–21: Meeting on materials and mechanisms of superconductivity: high temperature superconductors, Grenoble (France), 4-9 Jul 1994). Order Number DE95001682. Source: OSTI; NTIS; INIS; GPO Dep.

A $Bi_2Sr_2CaCu_2O_8$ crystal selectively irradiated near the edges is studied using a Hall-sensor array. Vortices penetrating into the central $J_c = 0$ region are "focused" in the center of the sample on increasing the applied field. In decreasing field, vortices leave the center and a large vortex accumulation is observed on the inner rim of the irradiated region. Spatially resolved magnetization measurements confirm the developed theoretical model.

2385 (LYCEN–9426) **Study of the isospin symmetry breaking in the light quark sea of the nucleon from the Drell-Yan process.** Bedjidian, M. (Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire); Contardo, D.; Descroix, E.; Drapier, O.; Grossiord, J.Y.; Guichard, A.; Haroutunian, R.; Malek, F.; Mandry, R.; Pizzi, J.R.; Baldit, A.; Barriere, C.; Castor, J.; ChamboNA51 Collaboration. Lyon-1 Univ., 69 - Villeurbanne (France). Inst. de Physique Nucleaire. Jun 1994. 10p. Order Number DE95607807. Source: OSTI; NTIS (US Sales Only); INIS.

The ratio of cross-sections for muon pair production through the Drell-Yan process in p-p an p-d reactions has been measured at $y \approx 0$, with 450 GeV/c incident protons. The asymmetry $A_{DY}=(\sigma^{pp}-\sigma^{pn})/(\sigma^{pp}+\sigma^{pn})$ amounts to $-0.09\pm0.02\pm0.025$. The ratio anti-u/anti-d of the nucleon sea structure functions derived from this measurement amounts to $0.51\pm0.04\pm0.05$ at $x=0.18$ and suggests that the isospin symmetry is broken in the light quark sea of the nucleon. (authors). 14 refs., 1 fig., 5 tabs.

2386 (RISO-R–754(EN)) **Relations between structural and superconducting properties of bulk and thin film high-T_c materials.** Hessel Andersen, N. Risoe National Lab., Roskilde (Denmark). Solid State Physics Dept. Jun 1994. 51p. Contract ENS-1443/90-0006; Contract ENS-1443/91-0005; Contract E Order Number DE95607808. Source: OSTI; NTIS; INIS.

EFP-90; EFP-91; EFP-93.

The structural ordering of oxygen deficient and Co-doped YBCO ($YBa_2Cu_{3-y}Co_yO_{6+x}$) have been studied experimentally, and by computer simulations of the oxygen ordering in the basal plane of the structure. The calculations are based on the two-dimensional ASYNNNI model and its modifications. Good agreement is established between the ASYNNNI calculations and the experimentally observed structural properties of the double cell ortho-II structure and the oxygen disordering process from Co-doping into the basal plane. A model that relates the superconducting transition temperature $T_c(x)$ of undoped YBCO and $T_c(y)$ of Co-doped YBCO to the formation of specific domains of the two orthorhombic ordered oxygen phases, ortho-I and ortho-II, shows a close agreement with experimental $T_c(x)$ and $T_c(y)$ data of samples prepared under equilibrium conditions. The structural changes as a result of metal ion substitutions and oxidation/reduction processes have been studied by neutron powder diffraction in $Pb_2Sr_2Ln_{1-x}Ca_xCu_3O_{8+y}$ (Ln = Y and Ho), $Nd_{1.85}Ce_{0.15}CuO_{4+y}$, and chemically oxidized $La_{2-x}Sr_xCuO_{4+y}$ $< x < 0.13$. Neutron diffraction studies of oxygen deficient pure ($y = 0$) and Al-doped $LnBa_2Cu_{3-y}Al_yO_{6+x}$ ($y < 0.19$, Ln = Y and Pr) have related a qualitatively similar high temperature antiferromagnetic phase, AF1. For Ln = Pr the Af1 phase is found for all oxygen stoichiometries, and a two-dimensional antiferromagnetic pr-ordered structure with weak ferromagnetic interplane correlations has been observed for oxidized samples. The structural ordering of epitaxial $YBa_2Cu_3O_{6+x}$ and $Bi_2Sr_2CaCu_2O_{8+x}$ thin

films deposited on $SrTiO_3$ (001), MgO (001), $LaAlO_3$ (001), and $NdGaO_3$ (001) substrates has been studied by x-ray diffraction, TEM and RBS, and the structural ordering has been analysed.

2387 (UCRL-JC–118407) **Generation and solution of effective many-body Hamiltonians for rare earth and transition metal compounds.** McMahan, A.K. Lawrence Livermore National Lab., CA (United States). Aug 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9407115–2: Electronic structure of solids using cluster methods workshop, East Lansing, MI (United States), 17-19 Jul 1994). Order Number DE95002402. Source: OSTI; NTIS; GPO Dep.

This paper gives an overview of the local density approximate (LDA) generation of effective Hamiltonians for a series of d and f electron Mott insulators and reviews their approximate solution for periodic clusters. The (charge-transfer insulator) materials considered are CeO_2 and PrO_2, the high-$T_c$parent La_2CuO_4, and three isostructural compounds, K_2CuF_4, K_2NiF_4, and La_2NiO_4. This paper first introduces the effective Hamiltonains in stages by considering first the Coulomb operator for a single atom or ion, and then introduces the additional hopping parameters required for a collection of atoms. Then an improved treatment of screening effects is considered, noting that Hartree-Fock calculations with screened interactions provide approximately correctinsulating gaps for charge-transfer insulators. Essential spin correlations and their impact on quasiparticle dispersion are discussed, based on configuration interaction calculations for clusters. The range of validity of the present effective Hamiltonians is discussed. Conclusions are offered. 64 refs, 4 figs, 3 tabs.

665420 Superfluidity

2388 (IC–94/129) **Correlated density matrix theory of spatially inhomogeneous Bose fluids.** Gernoth, K.A. (International Centre for Theoretical Physics, Trieste (Italy)); Clark, J.W.; Ristig, M.L. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 13p. Order Number DE95607840. Source: OSTI; NTIS (US Sales Only); INIS.

In this paper, the variational Hartree-Jastrow theory of the ground state of spatially inhomogeneous Bose systems is extended to finite temperatures. The theory presented here is a generalization also in the sense that it extends the correlated density matrix approach, formulated previously for uniform Bose fluids, to systems with nonuniform density profiles. The method provides a framework in which the effects of thermal excitations on the spatial structure of a Bose fluid, as represented by the density profile and the two-body distribution functions, may be discussed on the basis on an ab initio microscopic description of the system. Thermal excitations make their appearance through self-consistently determined one-body and two-body potentials which enter the nonlinear, coupled Euler-Lagrange equations for the one-body density and for the pair distribution function. Since back-flow correlations are neglected, the excitations are described by a Feynman eigenvalue equation, suitably generalized to nonzero temperatures. The only external quantities entering the correlated density matrix theory elaborated here are the bare two-body interaction potential and, in actual applications, the boundary conditions to be imposed on the one-body density. 30 refs.

2389 (IC–94/160) **The surface of liquid ^{4}He at nonzero temperatures.** Gernoth, K.A. (International Centre for Theoretical Physics, Trieste (Italy)); Clark, J.W.; Ristig, M.L. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 8p. Order Number DE95607841. Source: OSTI; NTIS (US Sales Only); INIS.

We outline a general approach to microscopic evaluation of the properties of strongly interacting, spatially inhomogeneous Bose systems at finite temperature. A minimum principle for the Helmholtz free energy is used together with an appropriate trial density matrix to generalize the correlated variational wave function theory that has proven so successful in the treatment of the ground states and elementary excitations of quantum fluids at zero temperature. Euler-Lagrange equations are obtained that determine the optimal structure through the one-and two-body densities and the optimal density fluctuation operators and energies characterizing the elementary excitations. Some results of an application of this correlated density matrix theory to the ^{4}He liquid-vapor interface are presented, with particular focus on the characterization of resonant vapor modes. (author). 23 refs, 2 figs.

665430 Other Topics in Quantum Fluids and Solids

Refer also to citation(s) 2069, 2070, 2072

2390 (IC–94/151) **Quantum group random walks in strongly correlated 2+1 D spin systems.** Protogenov, A.P. (International Centre for Theoretical Physics, Trieste (Italy)); Rostovtsev, Yu.V.; Verbus, V.A. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 9p. Order Number DE95607844. Source: OSTI; NTIS (US Sales Only); INIS.

We consider the temporal evolution of strong correlated degrees of freedom in 2+1 D spin systems using the Wilson operator eigenvalues as variables. It is shown that the quantum-group diffusion equation at deformation parameter q being the k-th root of unity has the polynomial solution of degree k. (author). 20 refs, 1 tab.

2391 (INIS-mf–14386, pp. WP24) **A series of quantum spin models on 3-dimensional lattices.** Oitmaa, J. (New South Wales Univ., Kensington, NSW (Australia). School of Physics); Hamer, C.J.; Weihong, Z. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ANTIFERROMAGNETIC MATERIALS/cubic lattices; ANTIFERROMAGNETIC MATERIALS/ising model; ISING MODEL/three-dimensional calculations; ENERGY GAP; MAGNETIC SUSCEPTIBILITY; MAGNETIZATION; PERTURBATION THEORY; QUANTUM OPERATORS; SERIES EXPANSION

2392 (INIS-mf–14386, pp. WP32) **Photoemission study of the Fermi surface of Cu.** Con Foo, Jenice (La Trobe Univ., Bundoora, VIC (Australia). Dept. of Physics); Leckey, R.; Riley, J. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. COPPER/fermi level; PHOTOEMISSION/fermi level; ANGULAR DISTRIBUTION; COPPER; ENERGY-LEVEL TRANSITIONS; PHOTOEMISSION; SCATTERING; SECONDARY EMISSION; THREE-DIMENSIONAL CALCULATIONS

2393 (INIS-mf–14386, pp. WP49) **Tunneling current in $Al_x Ga_{1-x} As/Al_y Ga_{1y} As/GaAs$ double barrier quantum well structures.** Osotchan, T. (Macquarie Univ., North Ryde, NSW (Australia). School of Mathematics and Physics); Chin, V.W.L.; Cheng, X.K.; Tansley, T.L. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. 2 refs. GALLIUM ARSENIDES/aluminium compounds; GALLIUM ARSENIDES/tunnel effect; TUNNEL EFFECT/quantum electronics; AIRY FUNCTIONS; COMPUTERIZED SIMULATION; PHOTODETECTORS; RESONANCE; SEMICONDUCTOR DEVICES; SURFACE BARRIER DETECTORS; WAVE FUNCTIONS

2394 (INIS-mf–14386, pp. WP61) **Lifetime and bistability in electron tunneling in a double barrier structure.** Fisher, D. (Wollongong Univ., NSW (Australia)); Zhang, C. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. SEMICONDUCTOR DIODES/tunnel effect; BOUND STATE; CARRIER LIFETIME; STABILITY

2395 (INIS-mf–14386, pp. TP63) **Electronic structural changes in $Y_{1-x} Pr_x Ba_2 Cu_3 O_{7-\delta}$ single crystals due to Pr4f states.** Hartman, A. (New South Wales Univ., Kensington, NSW

(Australia). School of Physics); Russell, G.J.; Taylor, K.N.R.; Frentrup, W. [1994]. 227p. (CONF-9402112–: 18. annual condensed matter physics meeting, Wagga Wagga (Australia), 9-11 Feb 1994). In *Australian and New Zealand Institutes of Physics. Eighteenth annual condensed matter physics meeting.* Order Number DE95605568.

Short communication. ELECTRONIC STRUCTURE/energy-loss spectroscopy; PRASEODYMIUM OXIDES/f states; SUPERCONDUCTING COMPOSITES/electronic structure; SUPERCONDUCTING COMPOSITES/praseodymium oxides; ABSORPTION SPECTROSCOPY; BARIUM OXIDES; COPPER OXIDES; D STATES; HYBRIDIZATION; ORTHORHOMBIC LATTICES; PHASE TRANSFORMATIONS; TETRAGONAL LATTICES; YTTRIUM OXIDES

2396 (IPNO-TH–93-52) **Quantum prewetting transitions in liquid ^{3}He.** Pricaupenko, L.; Treiner, J. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. 28 Sep 1993. [15p.] Order Number DE95607845. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Physical Review Letters (US).

Multilayer ^{3}He film growth on weak-binding alkali substrates is investigated with a non-local density functional theory. Although ^{3}He wets all substrates, prewetting transitions are predicted to occur on cesium and potassium. Emphasis is put on the role played by the Fermi statistics. Prewetting critical temperatures are estimated. Continuous wetting at zero temperature is recovered with increasing strength of substrate potential. The heat capacity and the magnetization of the films exhibits steps associated with the occupation of two-dimensional (2D) Fermi discs. (authors). 24 refs., 4 figs.

2397 (LBL–36063) **Correlated wavefunction Monte Carlo studies of excitations in the quantum Hall liquids.** Kralik, B. (Univ. of California, Berkeley, CA (United States). Dept. of Physics); Rappe, A.M.; Louie, S.G. Lawrence Berkeley Lab., CA (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC03-76SF00098. Grant DMR91-20269. (CONF-9408155–10: 22. international conference on physics of semiconductors, Vancouver (Canada), 15-19 Aug 1994). Order Number DE95002337. Source: OSTI; NTIS; INIS; GPO Dep.

Various excitations in the quantum Hall liquid at different Landau level filling factors are studied using a variational quantum Monte Carlo approach. Quantities calculated include spin-flip energies and dispersion relations for the collective modes (the magnetorotons and magnetoplasmons). The present approach goes beyond the lowest-Landau-level and single-mode approximations commonly used in previous studies. The inclusion of Landau-level mixing along with finite-thickness and donor effects satisfactorily explains values for the $\nu = 1$ spin-flip energy that are found in recent photoluminescence experiments on δ-doped samples. In the case of the magnetorotons at $\nu = 1/3$, the authors show that multiple-mode effects can change the excitation energies significantly, especially for high r_s samples (by nearly 50% at $r_s = 20$).

2398 (UM-P–93/56) **Magnetized pair Bose gas: relativistic superconductor.** Daicic, J.; Frankel, N.E.; Kowalenko, V. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 10p. Sponsored by Australian Research Council, Canberra, ACT (Australia). Order Number DE95607846. Source: OSTI; NTIS (US Sales Only); INIS.

The magnetized Bose gas at temperatures above pair threshold is investigated. New magnetization laws are obtained for a wide range of field strengths, and the gas is shown to exhibit the Meissner effect. Some related results for the Fermi gas, a relativistic paramagnet, are also discussed. It is concluded that the pair gases, through the interplay between pair creation, temperature, field strength, statistics and/in the case of fermions/spin, have remarkable magnetic properties. 14 refs.

70 PLASMA PHYSICS AND FUSION

Refer also to citation(s) 2452

7003 Plasma Physics and Fusion Research

Refer also to citation(s) 1498, 2443

2399 (AREAEE–289) **Plasma rotation in coaxial discharges.** Masoud, M.M.; Soliman, H.M.; Elkhalafawy, T.A. Nuclear Research Centre, Inshas (Egypt). 1985. 14p. Order Number DE95607623. Source: OSTI; NTIS (US Sales Only); INIS.

Plasma rotation has been observed near the breech of the coaxial electrodes, which propagates inside the coaxial gun and moreover this has been detected in the expansion chamber. Azimuthal component of plasma current has been detected. The measuring of the axial magnetic field distribution in time along the expansion chamber-axis shows a single maximum peak for all position. Azimuthal component of electric field exists along the axis of the expansion chamber and results for two angular positions (0^0, 180^0) at r 2.5 cm has been presented. Thus it is obvious that the whole plasma bulk moves in a screw configuration before and after the focus position. 9 fig.

2400 (AREAEE–294) **Viscosity effect on plasma sheath dynamic in plasma focus.** Masoud, M.M.; Soliman, H.M.; Elkhalafawy, T.A. Nuclear Research Centre, Inshas (Egypt). 1986. 13p. Order Number DE95607648. Source: OSTI; NTIS (US Sales Only); INIS.

Effect of viscosity on the shape of the plasma sheath formed in coaxial discharges has been discussed theoretically by using Navier stokes equations and Hartmann boundary conditions. The numerical calculations for the Hartmann flow show a maximum peak of plasma sheath near the central electrode. Rotating current has been calculated theoretically by equating the rate of change of angular momentum of plasma sheath with the Lorentz force of the axial magnetic field and the radial discharge current. Streak photography shows two plasma streams flow simultaneously out of the muzzle. Self induced axial magnetic field within the plasma sheath has been observed experimentally and it is attributed to the plasma rotation within the sheath. Theoretical and experimental results are in a good agreement. 6 fig.

2401 (AREAEE–297) **Plasma focus matching conditions.** Soliman, H.M.; Masoud, M.M.; Elkhalafawy, T.A. Nuclear Research Centre, Inshas (Egypt). 1988. 16p. Order Number DE95607624. Source: OSTI; NTIS (US Sales Only); INIS.

A snow-plough and slug models have been used to obtain the optimum matching conditions of the plasma in the focus. The dimensions of the plasma focus device are, inner electrode radius = 2 cm, outer electrode radius = 5.5 cm, and its length = 8 cm. It was found that the maximum magnetic energy of 12.26 kJ has to be delivered to plasma focus whose density is 10^{19}/cm^3 at focusing time of 2.55 μs and with total external inductance of 24.2 n H. The same method is used to evaluate the optimum matching conditions for the previous coaxial discharge system which had inner electrode radius = 1.6 cm, outer electrode radius = 3.3 cm and its length = 31.5 cm. These conditions are charging voltage = 12 kV, capacity of the condenser bank = 430 μf, plasma focus density = 10^{19}/cm^3 focusing time = 8 μs and total external inductance = 60.32 n H.3 fig., 2 tab.

2402 (CEA-N–2739) **On different models to deal with collisions between ionic and electronic populations.** Sentis, R. CEA Centre d'Etudes de Limeil, 94 - Villeneuve-Saint-Georges (France). Aug 1993. 44p. (In French). Order Number DE95607642. Source: OSTI; NTIS (US Sales Only); INIS.

A Fokker-Planck model and a Boltzmann model are adapted to handle the collisions phenomena between ions and electrons. It is proved that in a sense the two models are equivalent. Also an hybrid model is introduced. It treats the ions in a kinetic approach while the electron population is described through a macroscopic parametrization. The numerical solution of these models was carried out through the classical Monte-Carlo procedures. 11 refs.

2403 (DOE/ER/53188–1) **Experimental investigations of electron capture from atomic hydrogen and deuterium by alpha particles: Final report, September 15, 1984–September 14, 1993.** Gay, T.J. Missouri Univ., Rolla, MO (United States). Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States).

DOE Contract FG02-84ER53188. Order Number DE95002138. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have succeeded in making state-selective measurements of charge capture by doubly-ionized helium colliding with ground-state neutral helium atoms, but failed to achieve the primary goal, which was to investigate atomic hydrogen targets. They discuss a number of ancillary experiments and calculations of relevance for fusion energy production that they have done. Reprints and preprints of publications resulting from this work are contained in an appendix.

2404 (DOE/ER/53243–6) **[Coaxial Slow Source]: [Annual report, November 16, 1990–November 15, 1991].** Jarboe, T.; Brooks, R. Washington Univ., Seattle, WA (United States). [1991]. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG06-87ER53243. Order Number DE94011634. Source: OSTI; NTIS; INIS; GPO Dep.

This chapter presents a review of work previously done on the CSS device. This includes results of operation of the independent as well as of the parallel devices. Results of modeling and simulation are presented which support this work. We summarize the conclusions of this chapter as follows. The CSS is capable of forming AFRCs which last as long as flux can be supplied with a loop voltage above ~100 Volts. The independent configuration CSS-U was radiation dominated yet still exhibited anomalously high flux losses. This is also probably true of the programmed formation AFRCs which have thus far been produced in the parallel device, CSSP. CSSP operation in tearing formation mode results in a rapidly heating long thin plasma, with good flux confinement properties, which is not radiation dominated. At later times, tearing results in the plasma behaving much like a programmed formation mode plasma, exhibiting magnetic activity, radiation losses and a greatly reduced flux confinement time. Modeling indicates that for programmed formation and a given inventory and impurity fraction, a flux addition rate must be found which results in a field low enough not to cause radiative collapse but high enough to result in axial equilibrium within the coil length.

2405 (DOE/ET/53088–667) **Hybrid model in general geometry.** Yagi, M. (Japan Atomic Energy Research Inst., Naka, Ibaraki (Japan). Plasma Analysis Div., Naka Fusion Research Establishment); Tajima, T.; Lebrun, M.J. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Sep 1994. 24p. Sponsored by USDOE, Washington, DC (United States);Japan Atomic Energy Research Inst., Tokyo (Japan). DOE Contract FG05-80ET53088. (IFSR–667). Order Number DE95002614. Source: OSTI; NTIS; INIS; GPO Dep.

We propose hybrid model equations in toroidal (or more general) geometry for magnetically confined plasmas. This is suitable for low frequency toroidal modes, for example, the trapped electron and current diffusive ballooning instabilities. This model consists of fluid ions and drift kinetic electrons. We discuss the numerical algorithm of these model equations. The linear dispersion relation of this model equations that defines the requirements of the model for describing these modes is also discussed.

2406 (DOE/ET/53088–678) **1/f noise in two-dimensional fluids.** Cable, S.B. (Southwest Research Inst., San Antonio, TX (United States)); Tajima, T. Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. Oct 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG05-80ET53088. Order Number DE95002617. Source: OSTI; NTIS; INIS; GPO Dep.

We derive an exact result on the velocity fluctuation power spectrum of an incompressible two-dimensional fluid. Employing the fluctuation-dissipation relationship and the enstrophy conversation, we obtain the frequency spectrum of a 1/f form.

2407 (DOE/FTR–94005434) **Travel to Germany for a meeting of the ITER Joint Central Team: Foreign trip report, October 19–28, 1993.** Temkin, R. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. 5 Jan 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC02-93ER54209. Order Number DE94005434. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The ITER Joint Central Team held a meeting at the Garching site from October 21–26, 1993. Both electron cyclotron heating (ECH) and ion cyclotron heating (ICH) were discussed. The purpose of the meeting was to discuss the following four aspects of each system, ECH and ICH: Physics issues of heating; System Design; Antenna performance; Proposed R&D. I participated mainly in the ECH discussions and will therefore not report on the ICH system discussions. The reports of other members of the US team (for example, D. Swain of ORNL) should be consulted for the relevant information about the ICH system. A proposal for an R&D program for the ITER gyrotrons was worked out at the meeting.

2408 (GA-A–21778) **Theory of the L-H transition.** Hinton, F.L. General Atomics, San Diego, CA (United States). Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. (CONF-9408176–1: ISPP workshop on the theory of fusion plasmas, Varenna (Italy), 22-26 Aug 1994). Order Number DE95001389. Source: OSTI; NTIS; INIS; GPO Dep.

The theory of the L-H transition in tokamaks is discussed. A transport bifurcation model is presented, which predicts reasonably well several properties of the L-H transition in the DIII-D tokamak, including the evolution in time of the density and temperature profiles. A bifurcation in the radial transport occurs because of a nonlinear feedback mechanism involving the radial electric field. A spontaneous transition is predicted when certain conditions are met; no trigger mechanism is necessary. The predicted profile evolution in H-mode can include a transition to VH-mode, with its characteristically wider transport barrier at the plasma edge. Trigger mechanisms are discussed, as well as the idea of considering the L-H transition as a phase transition.

2409 (IC–94/134) **Self-focusing of electromagnetic radiation in electron-positron ion plasma.** Berezhiani, V.I.; Mahajan, S.M. International Centre for Theoretical Physics, Trieste (Italy). Jun 1994. 8p. Order Number DE95607626. Source: OSTI; NTIS (US Sales Only); INIS.

We consider the self-focusing of electromagnetic (EM) radiation in electron-positron plasmas with a small fraction of ions. It is shown that in such a plasma EM pulses may form and propagate like oscillatory waveguides. (author). 12 refs.

2410 (IC–94/142) **Evolution of Spark plasma using nitrogen laser shadowgraphy system.** Ishiekwene, G.C. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 13p. Order Number DE95607598. Source: OSTI; NTIS (US Sales Only); INIS.

A simple, low cost, home built high power nitrogen laser is used as the light source for a shadowgraphy system. A series of shadowgrams depicting the temporal growth of a spark plasma discharge is obtained. The results could be useful in plasma diagnostic studies. (author). 5 refs, 6 figs.

2411 (IC–94/157) **Solitons in electron-positron plasma.** Carlini, G. (Trieste Univ. (Italy). Ist. di Fisica); Berezhiani, V.I. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 8p. Order Number DE95607608. Source: OSTI; NTIS (US Sales Only); INIS.

The nonlinear propagation of "ordinary" electromagnetic waves in electron-positron plasma is considered. The possibility to find soliton solitons in such a plasma is explored. (author). 6 refs, 1 fig.

2412 (IC–94/200) **Construction of a nitrogen laser for plasma diagnostics.** Ishiekwene, G.C. International Centre for Theoretical Physics, Trieste (Italy). Jul 1994. 10p. Order Number DE95607599. Source: OSTI; NTIS (US Sales Only); INIS.

The challenge faced in finding new sources of energy to bridge the gap between the availability and demand of energy is difficult to be overemphasized. Nuclear fusion seems to provide a potentially limitless source of energy which offers a bright prospect for solving this problem. Although an elaborate programme in fusion may be beyond the economic reach of most third world countries, some modest experiments are necessary to provide an indigenous expertise capable of enhancing international fusion studies. In order to initiate experimental research sufficient for plasma studies at an affordable cost to developing countries, this paper illustrates the construction of a simple, low cost, high power nitrogen laser and investigates some of its performance characteristics. Also, the laser is utilized as a source of illumination in the techniques of shadowgraphy. A series of shadowgrams depicting the temporal

development of the plasma discharge is presented. The constructed laser is found to be cost-effective and useful in small-scale researches in laser-plasma diagnostics. (author). 6 refs, 5 figs.

2413 (ITF–94-4) **Dynamics of structure formation in nonequilibrium systems (Wave Media).** Zagorodnij, A.G.; Kirichok, A.V.; Kuklin, V.M.; Panchenko, I.P. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 28p. (In Russian). Order Number DE95607609. Source: OSTI; NTIS (US Sales Only); INIS.

Structures play a significant role in the processes of energy transfer in nonequilibrium dissipative systems. In this paper, the processes of dissipative structure formation and evolution in both weak nonequilibrium and strong nonequilibrium systems.

2414 (ITP–94-8) **Fluctuations in macroscopically agitated plasma:quasiparticles and effective temperature.** Sosenko, P.P.; Gresillon, D. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 9p. Order Number DE95607611. Source: OSTI; NTIS (US Sales Only); INIS.

Fluctuations in the plasma, in which macroscopic fluid-like motion is agitated due to large-scale and low-frequency electromagnetic fields, are studied. Such fields can be produced by external factors or internally, for example due to turbulence. Fluctuation spectral distributions are calculated with regard to the renormalization of the transition probability for a test-particle and of the test-particle shielding. If the correlation length for the random fluid-like motion is large as compared to the fluctuation scale lengths, then the fluctuation spectral distributions can be explained in terms of quasiparticles originating from macroscopic plasma agitation and of an effective temperature.

2415 (ITP–94-9) **Fluctuations and electromagnetic wave scattering in macroscopically agitated plasma: effects of turbulent diffusion.** Sosenko, P.P.; Gresillon, D. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 15p. Order Number DE95607612. Source: OSTI; NTIS (US Sales Only); INIS.

In order to explain some observations of space and fusion plasmas, it is possible to assume that fluid-like plasma motion occurs. In this paper, fluctuation spectral distributions in such plasmas are investigated, when the renormalization of the test-particle transition probability and test-particle shielding are important. It is demonstrated that in the case of small correlation lengths for fluid-like motion, as compared to the fluctuation scale lengths, transformations of fluctuation spectral distributions are subordinated to the magnitude of a turbulent diffusion coefficient. This peculiarity can be exploited in plasma diagnostics as a tool for measuring the diffusion coefficient. This peculiarity can be exploited in plasma diagnostics as a tool for measuring the diffusion coefficient.

2416 (ITP–94-10) **Quasiparticles in magnetized plasma.** Sosenko, P.P.; Decyk, V.K. AN Ukrainskoj SSR, Kiev (Ukraine). Inst. Teoreticheskoj Fiziki. 1994. 17p. Order Number DE95607610. Source: OSTI; NTIS (US Sales Only); INIS.

The quasiparticle approach to the description of the magnetized plasma is reviewed.

2417 (LA-UR–94-3666) **Heating and transport in TFTR D-T plasmas.** Zarnstorff, M.C. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Scott, S.D.; Barnes, C.W. Los Alamos National Lab., NM (United States); Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073 ; W-7405-ENG-36. (CONF-940933–15: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95002812. Source: OSTI; NTIS; INIS; GPO Dep.

The confinement and heating of supershot plasmas are significantly enhanced with tritium beam injection relative to deuterium injection in TFTR. The global energy confinement and local thermal transport are analyzed for deuterium and tritium fueled plasmas to quantify their dependence on the average mass of the hydrogenic ions. The radial profiles of the deuterium and tritium densities are determined from the DT fusion neutron emission profile.

2418 (LRP–497/94) **Visible photoluminescence from hydrogenated silicon particles suspended in a silane plasma.** Courteille, C. (Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP)); Dorier, J.L.; Dutta, J.; Hollenstein, C.; Howling, A.A.; Stoto, T. Ecole Polytechnique Federale, Lausanne (Switzerland). Centre de Recherche en Physique des Plasma (CRPP). Sep 1994. 19p. Order Number DE95607649. Source: OSTI; NTIS; INIS.

Visible photoluminescence at room temperature has been observed in amorphous hydrogenated silicon particulates during their formation in a silane radio-frequency plasma. Oxygen injection along with mass spectrometry measurements demonstrate that oxygen has no influence on the photoluminescence. The appearance of visible photoluminescence coincides with a particle agglomeration phase as shown by laser light scattering experiments, and electron microscopy shows silicon nanocrystals within these particulates. These observations of visible photoluminescence are consistent with the model of quantum confinement in the silicon nanocrystals. (author) 5 figs., 45 refs.

2419 (PPPL–2975) **ICRF-induced DD fusion product losses in TFTR.** Darrow, D.S. (and others); Zweben, S.J.; Budny, R.V. Princeton Univ., NJ (United States). Plasma Physics Lab. Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95001928. Source: OSTI; NTIS; INIS; GPO Dep.

When ICRF power is applied to TFTR plasmas in which there is no externally-supplied minority species, an enhanced loss of DD fusion products results. The characteristics of the loss are consistent with particles at or near the birth energy having their perpendicular velocity increased by the ICRF such that those near the passing/trapped boundary are carried into the first orbit loss cone. A rudimentary model of this process predicts losses of a magnitude similar to those seen. Extrapolations based upon this data for hypothetical ICRF ash removal from reactor plasmas suggest that the technique will not be energy efficient.

2420 (PPPL–3010) **D-T radiation effects on TFTR diagnostics.** Ramsey, A.T. Princeton Univ., NJ (United States). Plasma Physics Lab. Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95001929. Source: OSTI; NTIS; INIS; GPO Dep.

For a 50%-50% deuterium-tritium plasma, the neutron production is 80× higher and the total energy release is 200× higher than the same plasma composed only of deuterium. With this increase in radiation, diagnostics which see only negligible amounts of noise during DD operation may find themselves overwhelmed during DT. The neutrons are not only more numerous, but have 6× as much energy, which causes the calculated 2.4× increase in the gamma flux per neutron near TFTR. We report here the effects of this increased radiation on the TFTR diagnostic set. The most noticeable effects are luminescence and transmission losses in fiber optic signal cables. In addition, a plastic fiber near the torus became unusably opaque after a few DT discharges. Silicon detectors show signs of neutron interactions as well as gamma response, and microchannel electron multipliers show an increased background due to the gamma flux. Bolometers show n and γ heating, and the Thomson scattering intensifier gate spark gap was unreliable until the gas pressure was adjusted. All of these effects were anticipated, and in some cases shielding or compensation techniques were used. Compensation fibers work satisfactorily at these radiation levels, and the rapid fall-off of the radiation as one moves away from the machine makes relocation of fibers and other sensitive components very useful. Conventional shielding designs worked when streaming through signal penetrations was properly dealt with. In coming DT campaigns and the generation of new tokamaks, such problems will be more severe. JET anticipates higher dose levels per shot during DT; TPX has 1000 s pulses and ITER presents a particularly difficult challenge. We shall discuss the implications of our results for diagnostics on these machines.

2421 (PPPL–3016) **The simulation of hard x-ray images obtained during lower hybrid current drive on PBX-M.** Goeler, S. von (and others); Fishman, H.; Ignat, D. Princeton Univ., NJ (United States). Plasma Physics Lab. Oct 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. Order Number DE95001930. Source: OSTI; NTIS; INIS; GPO Dep.

During lower hybrid current drive on PBX-M suprathermal electrons in the 30 to 150 keV range are generated. These electrons emit hard X-ray bremsstrahlung in collisions with plasma ions; the radiation creates images in a hard X-ray pinhole camera. In order to interpret the hard X-ray images, a computer simulation code has been written, the PBXRAY code. It represents an extension of the STEVENS code that calculates the free-free and free-bound radiation for non-Maxwellian relativistic electron tail distributions. The PBXRAY code provides the chord integration in the bean-shaped plasma geometry on PBX-M and integrates over photon energy. The simulations show that the location of the suprathermal electrons can be determined with an accuracy of approximately two centimeters in the plasma. In particular, the authors analyzed discharges whose characteristic "hollow" images indicate off-axis LH current drive. A comparison of images taken with different absorber foils reveals that the suprathermal electrons have less than 150 keV parallel energy for the hollow discharges.

2422 (PPPL-CFP–3163) **ICRF heating of deuterium-tritium plasmas in TFTR.** Taylor, G. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Adler, H.; Murakami, M. Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073. (IAEA-CN–60/A-3-I-3; CONF-940933–11: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95002219. Source: OSTI; NTIS; INIS; GPO Dep.

The first experiments to heat D-T plasmas in the ion cyclotron range of frequencies (ICRF) have been performed on the Tokamak Fusion Test Reactor (TFTR). These experiments have two major objectives: to study the RF physics of ICRF-heated D-T plasmas and to enhance the performance of D-T discharges. Experiments have been conducted at 43 MHz with out-of-phase current strap excitation to explore n_T/n_e concentrations up to approximately 40%. In these experiments n_T/n_e was limited by D recycling from the carbon walls. The location of the T resonance was varied by changing the toroidal magnetic field, and the RF power was modulated (f_{mod} = 5–10 Hz) to elucidate competing heating mechanisms. Up to 5.8 MW of ICRF heating has been coupled into D-T plasmas. The addition of 5.5 MW of ICRF heating on a D-T supershot resulted in an increase in central ion temperature from 26 to 36 keV and an increase in central electron temperature from 8 to 10.5 keV. Up to 80% of the absorbed ICRF power was coupled directly to ions, in good agreement with computer code predictions. These results extrapolate to efficient T heating in future devices such as ITER.

2423 (PPPL-CFP–3167) **Projection of ITER performance using the multi-machine L- and H- mode databases.** Kaye, S.M. (Princeton Univ., NJ (United States). Plasma Physics Lab.). Princeton Univ., NJ (United States). James Forrestal Research Center; General Atomics, San Diego, CA (United States); Massachusetts Inst. of Tech., Cambridge, MA (United States). [1994]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH03073 ; AC03-89ER51114 ; AC02-78ET51013. (IAEA-CN–60/E-P-3; CONF-940933–10: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95002221. Source: OSTI; NTIS; INIS; GPO Dep.

An overview of recent analyses of H- and L-mode confinement and L- to H-mode threshold data is presented. The standard subset of the H-mode database, consisting of about 1600 time slices from six tokamaks, leads to power law scalings for ELMy and ELM-free discharges, both of which predict a confinement time for ITER of approximately 5.5 sec. The analysis indicates a strong dependence of confinement time scaling and prediction on the neutral penetration from the divertor into the main chamber. Consideration of dimensionless variables suggest scaling expressions for the H-mode threshold which predict threshold powers for ITER of between 100 and 200 MW. Finally, the L-mode database has been updated to contain over 1500 time-slices from eleven tokamaks. A preliminary empirical scaling based on the total confinement time has been developed.

2424 (TRITA-ALP–94-2) **Multicomponent double layers and selective acceleration of charged particles.** Carlqvist, P. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics. Mar 1994. 21p. (KTH-ALP-R–94-2.). Order Number DE95607603. Source: OSTI; NTIS; INIS.

Multicomponent double layers, defined as layers composed of more than two kinds of charged particles, are supposed to constitute the predominant type of double layer in cosmic plasmas. A model of a steady and strong multicomponent double layer is studied in both the non-relativistic and relativistic approximations. In particular such properties of the layer as the structure, potential drop, and current composition are investigated. It is demonstrated that the density distribution of each kind of the positive and negative particles in the non-relativistic multicomponent layer is of the same shape as the density distribution of the ions and electrons, respectively, in Langmuir's two-component layer. Also the shape of the distribution of the electric field corresponds to that of the two-component layer. In the relativistic layer the charges are distributed among two very thin layers of high positive and negative charge density close to the anode and cathode boundaries of the layer, respectively, and a constant but low charge density in the rest of the layer. It is shown that the potential drop across the multicomponent layer is proportional to the thickness of the layer raised to 4/3 in the non-relativistic case while it is directly proportional to the thickness in the relativistic case. Current conditions prescribing the allowed sets of the current densities of the various kinds of particles in the layer are derived in the non-relativistic and relativistic approximations. Correspondingly abundance conditions for the particles accelerated through the layer are also obtained. The abundance of the particles accelerated by the double layer is expected generally to be different from the abundance of the ambient plasma. It is suggested that the abundance of the accelerated particles might serve as a means to detect double layers, especially in space plasmas. 20 refs., 2 figs.

2425 (TRITA-ALP–94-3) **A technique for calculating the field aligned conductance and ionospheric Pedersen conductivity from high altitude electric and magnetic field data.** Shapshak, M. (Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics); Block, L.P.; Woch, J.; Elphinstone, R.; Zanetti, L. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics. May 1994. 18p. (KTH-ALP-R–94-3.). Order Number DE95607590. Source: OSTI; NTIS; INIS.

A model of auroral arcs is developed for use with high altitude electric and magnetic field satellite data. The model incorporates a magnetic field aligned Ohm's law as an approximation to the linear part of the Fridman-Lemaire equation. Also included is the Robinson empirical relation for the ionospheric Pedersen conductivity. The model output is the ionospheric electric field E_i, the field aligned conductance per unit area, a, the height integrated Pedersen conductivity Σ_p and the parallel potential drop V.This new method of calculating V is an improved version of method 5 in Block and Faelthammar [1989]. The calculated parallel potential drops are in agreement with particle data. The resulting values of a vary between $1\text{-}3\times10^{-9}$S/m^2 in the central portion of the morning high latitude arcs studied. Outside of this region the values are more variable and range up to 1×10^{-8}S/m^2. 17 refs., 6 figs.

2426 (TRITA-ALP–94-4) **Plasma characteristics determined by the Freja electric field instrument.** Lindqvist, P.A.; Marklund, G.T.; Blomberg, L.G. Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics. 17 May 1994. 12p. (KTH-ALP-R–94-4.). Order Number DE95607591. Source: OSTI; NTIS; INIS.

A new approach to the study of ionospheric plasma characteristics is presented using data from the Freja double probe electric field instrument. Plasma characteristics are derived from continuous measurements of the satellite potential and from intermittent Langmuir sweeps. These provide information on both relative variations in the plasma density and absolute density and temperature, useful for comparisons with other plasma measurements on Freja, and essential for the interpretation of the electric field measurements. The on-board memory makes it possible to obtain full-orbit coverage of this type of information, which is a new feature of the Freja measurements. The memory is also used for high time resolution Langmuir sweeps which allow for the first time detailed studies of the time behaviour of the probe response and computation of the probe-plasma capacitance. Comparisons are also made with similar measurements on earlier missions. 11 refs., 5 figs.

2427 (UCRL-ID–116263) **MTX final report.** Hooper, E.B. (ed.) (and others); Allen, S.L.; Brown, M.D.; Byers, J.A.; Casper, T.A.; Cohen, B.I.; Cohen, R.H.; Fenstermacher, M.E.; Foote, J.H.; Hoshino, K. Lawrence Livermore National Lab., CA (United States). Jan 1994. 437p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95002960. Source: OSTI; NTIS; INIS; GPO Dep.

The MTX experiment was proposed in 1986 to apply high frequency microwaves generated by a free-electron laser (FEL) to electron cyclotron resonance heating (ECRH) in a high field, high density tokamak. As the absorption of microwaves at the electron cyclotron resonance requires high frequencies, the opportunity of applying a free-electron laser has appeal as the device is not limited to frequencies in the microwave or long millimeter wavelength regions, in contrast to many other sources. In addition, the FEL is inherently a high power source of microwaves, which would permit single units of 10 MW or more, optimum for reactors. Finally, it was recognized early in the study of the application of the FEL based on the induction linear accelerator, that the nonlinear effects associated with the intense pulses of microwaves naturally generated would offer several unique opportunities to apply ECRH to current drive, MHD control, and other plasma effects. It was consequently decided to adapt the induction accelerator based FEL to heating and controlling the tokamak, and to conduct experiments on the associated physics. To this end, the Alcator C tokamak was moved from the Massachusetts Institute of Technology (MIT) to the Lawrence Livermore National Laboratory where it was installed in Building 431 and operated from March, 1989, until the conclusion of the experiment in October, 1992. The FEL, based on the ETA-11 accelerator and IMP wiggler was brought into operation by the LLNL Electron Beam Group and power injected into the tokamak during an experimental run in the Fall, 1989. Following an upgrade by the MTX group, a second experimental run was made lasting from the Winter, 1992 through the end of the experiment. Significant contributions to the ECRH experiments were made by the Japan Atomic Energy Research Institute (JAERI).

2428 (UM-P–93/04) **Two dimensional Bose plasma in a magnetic field.** Bardos, D.C.; Hines, D.F.; Frankel, N.E. Melbourne Univ., Parkville, VIC (Australia). School of Physics. [1993]. 25p. Order Number DE95607629. Source: OSTI; NTIS (US Sales Only); INIS.

The dielectric response of a planar Bose plasma is investigated in the presence of a constant external magnetic field. The conductivity tensor is derived in the self-consistent Random Phase Approximation. The tensor components are evaluated at zero temperature, leading to explicit dispersion relations for the electrodynamic models of the plasma. For plasma layers. longitudinal and transverse modes are in general coupled. These coupled modes are investigated in detail. 24 refs.

7004 Fusion Technology

Refer also to citation(s) 924, 1100, 2427

2429 (ANL/TD/CP–83926) **The effect of a magnetic field on heat transfer in a slotted channel.** Evtushenko, I.A. (D.V. Efremov Scientific Research Institute of Electrophysical Apparatus, St. Petersburg (Russian Federation)); Kirillov, I.R.; Sidorenkov, S.S.; Hua, T.Q.; Reed, C.B. Argonne National Lab., IL (United States). Jul 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940664–28: ISFNT-3: 3rd international symposium on fusion nuclear technology, Los Angeles, CA (United States), 27 Jun - 1 jul 1994). Order Number DE94018369. Source: OSTI; NTIS; INIS; GPO Dep.

The results of numerical and experimental studies of liquid metal heat transfer in slotted channels in a transverse magnetic field are presented. Test results showed an improvement in heat transfer in a straight channel at low and moderate interaction parameter, N. The Nusselt number at small N (around 120) was up to 2 times higher than in turbulent flow without a magnetic field, Peclet number being equal. This effect of heat transfer enhancement is caused by the generation and development of large scale velocity fluctuations in the near heated wall area. Qualitative and quantitative correlations between heat transfer and velocity fluctuation characteristics are presented.

2430 (ANL/TD/CP–83927) **MHD-flow in slotted channels with conducting walls.** Evtushenko, I.A. (D.V. Efremov Scientific Research Institute of Electrophysical Apparatus, St. Petersburg (Russian Federation)); Kirillov, I.R.; Reed, C.B. Argonne National Lab., IL (United States). Jul 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-940664–29: ISFNT-3: 3rd international symposium on fusion nuclear technology, Los Angeles, CA (United States), 27 Jun - 1 jul 1994). Order Number DE94018370. Source: OSTI; NTIS; INIS; GPO Dep.

A review of experimental results is presented for magnetohydrodynamic (MHD) flow in rectangular channels with conducting walls and high aspect ratios (longer side parallel to the applied magnetic field), which are called slotted channels. The slotted channel concept was conceived at Efremov Institute as a method for reducing MHD pressure drop in liquid metal cooled blanket design. The experiments conducted by the authors were aimed at studying both fully developed MHD-flow, and the effect of a magnetic field on the hydrodynamics of 3-D flows in slotted channels. Tests were carried out on five models of the slotted geometry. A good agreement between test and theoretical results for the pressure drop in slotted channels was demonstrated. Application of a "one-electrode movable probe" for velocity measurement permitted measurement of the M-shape velocity profiles in the slotted channels. Suppression of 3-D inertial effects in slotted channels of complex geometry was demonstrated based on potential distribution data.

2431 (DOE/ER/54186–T2) **Joule heating of the ITER TF cold structure: Effects of vertical control coil currents and ELMS.** Radovinsky, A.; Pillsbury, R.D. Jr. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center. 9 Nov 1993. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC02-93ER54186. (PFC/RR–93-7). Order Number DE95001817. Source: OSTI; NTIS; INIS; GPO Dep.

The toroidal field coil and support structures for ITER are maintained at cryogenic temperatures. The time-varying currents in the poloidal field coil system will induce eddy currents in these structures. The associated Joule dissipation will cause local heating and require heat removal which will show up as a load on the cryogenic system. Studies of Joule heating of the ITER TF cold structure (TFCS) due to the currents in the poloidal field coil system are presented. The two regimes considered in this study are the plasma vertical stability control and the Edge Loss Mode (ELM) events. The 3-D, thin-shell, eddy current program, EDDYCUFF was used to analyze the eddy currents and Joule losses in the cold structure. The current versus time scenarios were defined. Four control coil options were studied. All schemes use coils external to the TF cold structure. Analyses of power depositions during the plasma vertical stability control were performed for each of the four options. For each of these options three different recovery times were assumed. The times were 3, 1, and 1/3 seconds. Sets of four sequential ELMs, as well as isolated ELMs have been studied for various sets of active PF coils. The results showed that the lowest average power dissipation in the TF cold structure occurs when a subset of PF2 and PF7 are active, and all the other PF coils are passive. The general conclusion is that to minimize power dissipation in the TF cold structure it is preferable that only coils PF2 and PF7 are active. The other coils (PF3-PF6) should be passive and driven by a condition of constant flux. It is recommended in particular, that coils PF3 and PF5 be allowed to change currents to conserve flux, since they provide the maximum shielding of the TFCS from the fields caused by the active coils.

2432 (DOE/ER/54186–T4) **Theory and modelling of quench in cable-in-conduit superconducting magnets.** Shajii, A. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center). Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center; EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1994. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC02-93ER54186 ; AC07-76ID01570. (PFC/RR–94-5). Order Number DE95001819. Source: OSTI; NTIS; INIS; GPO Dep.

Submitted to the Massachusetts Institute of Technology.

A new simple, self consistent theoretical model is presented that describes the phenomena of quench propagation in Cable-In-Conduit superconducting magnets. The model (Quencher) circumvents many of the difficulties associated with obtaining numerical solutions in more general existing models. Specifically, a factor of 30-50 is gained in CPU time over the general, explicit time dependent codes used to study typical quench events. The corresponding numerical implementation of the new model is described and the numerical results are shown to agree very well with those of the more general models, as well as with experimental data. Further, well justified approximations lead to the MacQuench model that is shown to be very accurate and considerably more efficient than the Quencher model. The MacQuench code is suitable for performing quench studies on a personal computer, requiring only several minutes of CPU time. In order to perform parametric studies on new conductor designs it is required to utilize a model such as MacQuench because of the high computational efficiency of this model. Finally, a set of analytic solutions for the problem of quench propagation in Cable-In-Conduit Conductors is presented. These analytic solutions represent the first such results that remain valid for the long time scales of interest during a quench process. The assumptions and the resulting simplifications that lead to the analytic solutions are discussed, and the regimes of validity of the various approximations are specified. The predictions of the analytic results are shown to be in very good agreement with numerical as well as experimental results. Important analytic scaling relations are verified by such comparisons, and the consequences of some of these scalings on currently designed superconducting magnets are discussed.

2433 (DOE/ER/54186–T5) **Current distribution in Cable-In-Conduit Conductors.** Ferri, M.A. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center; Oak Ridge Inst. for Science and Education, TN (United States). May 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC02-93ER54186 ; AC05-76OR00033. (PFC/RR–94-6). Order Number DE95001820. Source: OSTI; NTIS; INIS; GPO Dep.

A numerical study of the current distribution in Cable-In-Conduit Conductors (CICC's) experiencing linearly ramping transport currents and transverse magnetic fields was conducted for both infinitely long, periodic cables and finite length cables terminated in low resistance joints. The goal of the study was to gain insight into the phenomenon known as Ramp Rate Limitation, an as yet unexplained correspondence between maximum attainable current and the ramp time taken to reach that current in CICC superconducting magnets. A discrete geometric model of a 27 strand multiply twisted CICC was developed to effectively represent the flux linkages, mutual inductances, and resistive contact points between the strands of an experimentally tested cable. The results of the numerical study showed that for fully periodic cables, the current imbalances due to ramping magnetic fields and ramping transport currents are negligible in the range of experimentally explored operating conditions. For finite length, joint terminated cables, however, significant imbalances can exist. Unfortunately, quantitative results are limited by a lack of knowledge of the transverse resistance between strands in the joints. Nonetheless, general results are presented showing the dependency of the imbalance on cable length, ramp time, and joint resistance for both ramping transverse magnet fields and ramping transport currents. At the conclusion of the study, it is suggested that calculated current imbalances in a finite length cable could cause certain strands to prematurely "quench" – become non-superconducting –thus leading to an instability for the entire cable. This numerically predicted "current imbalance instability" is compared to the experimentally observed Ramp Rate Limitation for the 27 strand CICC sample.

2434 (EGG-FSP–11193) **A summary and assessment of oxidation driven volatility experiments at the INEL and their application to fusion reactor safety assessments.** McCarthy, K.A.; Smolik, G.R.; Harms, S.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002012. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains a summary and assessment of oxidation-driven volatility tests through March 1994 at the Idaho National Engineering Laboratory. Materials tested include a Cu alloy in air and steam, PCA stainless steel (similar to 316SS) in air and steam, AMCR-033 steel in air, HT-9 steel in air and steam, a Nb alloy in air and steam, a W alloy in air and steam, and two V alloys in air with a limited number of tests in steam. We give a brief description of the tests, including alloy compositions and test temperatures. For many materials, our results indicate that both volatility and oxide spalling are responsible for mobilizing mass, thus we refer to our measurements as mass flux or mobility flux. We plot mobility data for each element and present curve fits to the data. We include a section on how the mobility information is used in safety assessments. We calculate the early dose inventory of a first wall made of each material tested (the early dose to the maximum exposed individual that would result if all the material were mobilized and transported to the site boundary), and the early dose that would result when mobility fractions are considered in the calculation. We use this information to assess the data by determining which elements are the most important and concentrating on providing the mobility data for those elements. We discuss where more data are needed, and our plans for obtaining that data. Additionally, we discuss what must be done to produce a database that will withstand regulatory scrutiny.

2435 (EGG-FSP–11307) **CHEMCON user's manual: Version 1.1.** Gaeta, M.J.; Merrill, B.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95001907. Source: OSTI; NTIS; GPO Dep.

CHEMCON is a computer program developed to analyze thermal transients of tokamak fusion reactors. It contains a one dimensional, cylindrical geometry, conduction model that allows a variety of heat transfer modes within nodes at node boundaries. The code includes properties for 13 solid materials and two gases. CHEMCON also contains specialized models for modeling chemical reactions of node boundaries with air and steam including the gases produced from these reactions. In addition, a model treating the collapse of radiation shields within a gap is also included. CHEMCON is used mainly to simulate the thermal transient for post-blowndown loss-of-coolant-accidents.

2436 (EGG-FSP–11348) **Assessment of database for interaction of tritium with ITER plasma facing materials.** Dolan, T.J.; Anderl, R.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002038. Source: OSTI; NTIS; INIS; GPO Dep.

The present work surveys recent literature on hydrogen isotope interactions with Be, SS and Inconels, Cu, C, and V, and alloys of Cu and V. The goals are (1) to provide input to the International Thermonuclear Experimental Reactor (ITER) team to help with tritium source term estimates for the Early Safety and Environmental Characterization Study and (2) to provide guidance for planning additional research that will be needed to fill gaps in the present materials database. Properties of diffusivity, solubility, permeability, chemical reactions, Soret effect, recombination coefficient, surface effects, trapping, porosity, layered structures, interfaces, and oxides are considered. Various materials data are tabulated, and a matrix display shows an assessment of the quality of the data available for each main property of each material. Recommendations are made for interim values of diffusivity and solubility to be used, pending further discussion by the ITER community.

2437 (EGG-FSP–11386) **Assessment of CONTAIN and MELCOR for performing LOCA and LOVA analyses in ITER.** Merrill, B.J.; Hagrman, D.L.; Gaeta, M.J.; Petti, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95002037. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the results of an assessment of the CONTAIN and MELCOR computer codes for ITER LOCA and LOVA applications. As part of the assessment, the results of running a test problem that describes an ITER LOCA are presented. It is concluded that the MELCOR code should be the preferred code for

ITER severe accident thermal hydraulic analyses. This code will require the least modification to be appropriate for calculating thermal hydraulic behavior in ITER relevant conditions that include vacuum, cryogenics, ITER temperatures, and the presence of a liquid metal test module. The assessment of the aerosol transport models in these codes concludes that several modifications would have to be made to CONTAIN and/or MELCOR to make them applicable to the aerosol transport part of severe accident analysis in ITER.

2438 (INIS-mf–13962) **Fusion Canada: Issue 1.** Atomic Energy of Canada Ltd., Chalk River, ON (Canada). National Fusion Program. Jul 1987. 12p. (In English, French). Order Number DE95607653. Source: OSTI; NTIS (US Sales Only); INIS.

This first issue of a quarterly newsletter announces the startup of the Tokamak de Varennes, describes Canada's national fusion program, and outlines the Canadian Fusion Fuels Technology Program. A map gives the location of the eleven principal fusion centres in Canada. (L.L.).

2439 (JAERI-M–94-038) **Benchmark experiment on a copper slab assembly bombarded by D-T neutrons.** Maekawa, Fujio (Japan Atomic Energy Research Inst., Tokai, Ibaraki (Japan). Tokai Research Establishment); Oyama, Yukio; Konno, Chikara; Ikeda, Yujiro; Maekawa, Hiroshi; Kosako, Kazuaki. Japan Atomic Energy Research Inst., Tokyo (Japan). Mar 1994. 83p. Order Number DE95709764. Source: OSTI; NTIS; INIS.

Copper is a very important material for fusion reactor because it is used in superconducting magnets or first walls and so on. To verify nuclear data of copper, a benchmark experiment was performed using the D-T neutron source of the FNS facility in Japan Atomic Energy Research Institute. An cylindrical experimental assembly of 629 mm in diameter and 608 mm in thickness made of pure copper was located at 200 mm from the D-T neutron source. In the assembly, the following quantities were measured; (i) neutron spectra in energy regions of MeV and keV, (ii) neutron reaction rates, (iii) prompt and decay gamma-ray spectra and (iv) gamma-ray heating rates. The obtained experimental data were compiled in this report. (author).

2440 (Juel–2872) **Recycling source terms for edge plasma fluid models and impact on convergence behavior of the BRAAMS 'B2' code.** Maddison, G.P. (AEA Technology, Culham (United Kingdom)); Reiter, D. Forschungszentrum Juelich GmbH (Germany). Inst. fuer Plasmaphysik; Association Euratom-Forschungszentrum Juelich GmbH (Germany). Feb 1994. 73p. Order Number DE95715502. Source: OSTI; NTIS (US Sales Only); INIS.

Predictive simulations of tokamak edge plasmas require the most authentic description of neutral particle recycling sources, not merely the most expedient numerically. Employing a prototypical ITER divertor arrangement under conditions of high recycling, trial calculations with the 'B2' steady-state edge plasma transport code, plus varying approximations or recycling, reveal marked sensitivity of both results and its convergence behaviour to details of sources incorporated. Comprehensive EIRENE Monte Carlo resolution of recycling is implemented by full and so-called 'shot' intermediate cycles between the plasma fluid and statistical neutral particle models. As generally for coupled differencing and stochastic procedures, though, overall convergence properties become more difficult to assess. A pragmatic criterion for the 'B2'/EIRENE code system is proposed to determine its success, proceeding from a stricter condition previously identified for one particular analytic approximation of recycling in 'B2'. Certain procedures are also inferred potentially to improve their convergence further. (orig.)

2441 (LA-UR–94-3165) **Effects of plasma physics on capsule implosions in gas-filled hohlraums.** Lindman, E.L.; Delamater, N.D.; Magelssen, G.R.; Hauer, A. Los Alamos National Lab., NM (United States). [1994]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9409226–3: ECLIM 23: laser interaction with matter, Oxford (United Kingdom), 19-23 Sep 1994). Order Number DE95000923. Source: OSTI; NTIS; GPO Dep.

Initial experiments on capsule implosions in gas-filled hohlraums have been carried out on the NOVA Laser at Lawrence Livermore National Laboratory. Observed capsule shapes from preliminary experiments are more oblate than predicted. Improvements in modeling required to calculate these experiments and additional experiments are being pursued.

2442 (LA-UR–94-3221) **Low density gas and foam targets for ICF long scale length plasma experiments: Fabrication & characterization.** Gobby, P.L.; Mitchell, M.A.; Eliott, N.E.; Salazar, M.A.; Fermandez, J.C.; Hsing, W.W.; Moore, J.E.; Gomez, V.M. Los Alamos National Lab., NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9410224–1: Laser interaction with matter, Oxford (United Kingdom), Oct 1994). Order Number DE95000935. Source: OSTI; NTIS; INIS; GPO Dep.

Recent ICF experiments performed by the laser-matter interaction group at Los Alamos using the Nova laser to investigate long scale length plasmas required two types of special targets: gas-filled hohlraums and free-standing low density foams, both with densities in the range of 3-5 mg/cc. The mass in each case was provided by hydrogen and carbon - in the form of polymethylpentyene for the foam case and 2.2-dimethylpropane (i.e., neopentane, C_5H_{12}) at 1 atmosphere for the gas case. Dopants of Cl, Ti, Cr and Mn were added to the foams, while Ti and Cr coated carbon fibers were added to the hohlraums - both for isoelectronic x-ray spectroscopic temperature measurements.

2443 (LA-UR–94-3665) **Review of recent D-T experiments from TFTR.** Hawryluk, R.J. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Adler, H.; Alling, P. Los Alamos National Lab., NM (United States). [1994]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-940933–14: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95002755. Source: OSTI; NTIS; INIS; GPO Dep.

An extensive set of deuterium-tritium (D-T) experiments has been carried out on the Tokamak Fusion Test Reactor (TFTR), using nearly equal concentrations of deuterium and tritium. The fusion power has been increased to 9.3 MW, using 34 MW of neutral-beam heating, in a supershot discharge and to 6.7 MW in a high-β_p discharge following a current rampdown. Extensive lithium pellet injection has increased the confinement time to 0.27 s and enabled higher current operation in both supershot and high-β_p discharges. The energy confinement time, τ_E, was observed to increase in D-T, relative to D plasmas, by 20% and the $n_i(0)\ T_i(0)\ \tau_E$ product by 55%. The improvement in thermal confinement was caused primarily by a decrease in ion heat conductivity in both supershot and limiter-H-mode discharges. ICRF heating of a D-T plasma, using the second harmonic of tritium, has been demonstrated. First measurements of the confined alpha particles have been performed and found to be in good agreement with TRANSP simulations. Initial measurements of the alpha ash profile have been compared with simulations using particle transport coefficients from He gas puffing experiments. The loss of alpha particles to a detector at the bottom of the vessel is well described by the first-orbit loss mechanism. No loss due to alpha-particle-driven instabilities has yet been observed. The TFTR experiments were able to challenge and confirm several of the underlying assumptions of the ITER design.

2444 (LA-UR–94-3667) **Fusion power production in TFTR.** Bell, M.G. (Princeton Univ., NJ (United States). Plasma Physics Lab.); Budny, R.V.; Barnes, C.W. Los Alamos National Lab., NM (United States); Princeton Univ., NJ (United States). Plasma Physics Lab. [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36 ; AC02-76CH03073. (CONF-940933–13: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95002756. Source: OSTI; NTIS; INIS; GPO Dep.

Up to 9.3 MW of fusion power has been produced from deuterium-tritium (DT) fusion reactions in the Tokamak Fusion Test Reactor (TFTR). The total fusion yield from a single plasma pulse has reached 6.5 MJ. The experiments in TFTR with deuterium-tritium plasmas fueled and heated by neutral beam injection span wide ranges in plasma and operating conditions. Through the use of lithium pellet conditioning to control the edge recycling, the plasma confinement in TFTR has been improved to the point

where the stability of the plasma to pressure driven modes is limiting the fusion power for plasma currents up to 2.5 MA. The central energy and fusion power densities in these plasmas are comparable to those expected in a thermalized DT reactor, such as ITER.

2445 (LBL–36067) **Induction linacs for heavy ion fusion.** Bangerter, R.O.; Faltens, A. Lawrence Berkeley Lab., CA (United States). Aug 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (HIFAN–671; CONF-9408125–38: 17. international LINAC conference, Tsukuba (Japan), 21-26 Aug 1994). Order Number DE95002357. Source: OSTI; NTIS; INIS; GPO Dep.

Inertial fusion target physics imposes important constraints on the design of linacs for heavy-ion fusion. The most challenging constraint from a scientific standpoint is the requirement that the accelerator deliver more than 10^{14} W of beam power to a small quantity (less than 100 mg) of matter. The most challenging constraint from an engineering standpoint is accelerator cost. This paper explains the target physics requirements and shows how they lead to constraints on the usual accelerator parameters such as kinetic energy, current, and emittance. It will be shown that improvements in the final focusing system would have a beneficial effect on both scientific feasibility and cost. The paper also discusses experiments that are presently underway in the United States, specifically, experiments on high-current injectors, recirculating induction accelerators, transverse beam combining, and a proposed accelerator called ILSE. Hardware development for ILSE is now in progress.

2446 (NRL/MR–6770-94-7609) **Transport efficiency studies for light-ion inertial confinement fusion.** Rose, D.V. (JAYCOR, Inc., Vienna, VA (United States)); Ottinger, P.F.; Olson, C.L. Naval Research Lab., Washington, DC (United States). 30 Sep 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001437. Source: OSTI; NTIS; INIS; GPO Dep.

The proposed Laboratory Microfusion Facility (LMF) will require $\geq$ 10 MJ of 30 MeV lithium ions to be transported and focused onto high-gain, high-yield inertial confinement fusion targets. The light-ion LMF approach used a multimodular system with individual ion extraction diodes as beam sources. Several transport schemes are being considered to deliver the individual ion beams to the centrally located target. Previous work examined the effect of time-of-flight bunching on energy transport efficiency, η_t, under realistic constraints on diode operation, beam transport, and packing. Target design considerations suggest that the instantaneous power efficiency, Γ_t, be maximized near peak power. Because of time-of-flight bunching, peak power occurs at the end of the power pulse for LMF designs. This work examined the effect of power efficiency tuning on η_t for three transport schemes. Results indicate that tuning the power pulse to maximize Γ_t, at about three-quarters through the pulse provides high power efficiency at the end of the pulse while still maintaining high η_t. In addition to power efficiency tuning, effects on η_t from variations of the diode impedance model and the diode voltage waveform are also examined.

2447 (UCRL-JC–118161) **Radiation-driven targets for heavy-ion fusion.** Ho, D.D.M.; Harte, J.A.; Tabak, M. Lawrence Livermore National Lab., CA (United States). Aug 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940933–12: 15. international conference on plasma physics and controlled nuclear fusion research, Seville (Spain), 26 Sep - 1 oct 1994). Order Number DE95002264. Source: OSTI; NTIS; INIS; GPO Dep.

The baseline hohlraum configuration for heavy-ion fusion has the radiation converters placed at opposite ends. For a capsule that absorbs about 1 MJ and has an initial radius of 0.234 cm, the minimum initial capsule to hohlraum surface area ratio that can provide an adequate time-dependent symmetry requirement for a capsule implosion is about 0.075, based on calculations using the view factor code GERTIE. The capsule implosion is calculated using the hydrodynamic code HYADES. The energy coupling efficiency between the hohlraum and the capsule is 21%, the peak hohlraum temperature is 260 eV, and the gain of this target system can be as high as 80. By placing the converters outside the hohlraum, the radii of the converters can be varied according to the beam focusing requirements while the hohlraum dimensions remain unchanged. By bending the radiation converters by 90°, one can obtain a hohlraum configuration that requires the ion beams to come in from only one direction.

99 GENERAL AND MISCELLANEOUS

Refer also to citation(s) 1971

2448 (DOE/EW/50625–T18-Vol.1) **Medical University of South Carolina Environmental Hazards Assessment Program annual report, July 1, 1993–June 30, 1994.** Medical Univ. of South Carolina, Charleston, SC (United States). [1994]. 163p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE94019072. Source: OSTI; NTIS; INIS; GPO Dep.

The Institute of Medicine and the Pew Health Profession Commission have advocated that physicians broaden their participation in the envirorunental aspects of medical care. Accordingly, both organizations recommend training of future primary care physicians for greater competencies and appreciation of this area of medicine. The extent to which family practice educators are receptive to incorporating this topic into the residency curriculum is not known. A national survey of directors of family practice programs was conducted to assess their attitudes about environmental health education in family practice residency training. The ultimate goal of this study was to provide information that will guide the development of an environmental health curriculum for family practice residency programs. Videotapes supporting this program have been indexed individually.

2449 (DOE/EW/50625–T18-Vol.2) **Medical University of South Carolina Environmental Hazards Assessment Program: Deliverables: Volume 2, Annual report, July 1, 1993–June 30, 1994.** Medical Univ. of South Carolina, Charleston, SC (United States). 18 Aug 1994. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE94019073. Source: OSTI; NTIS; INIS; GPO Dep.

This reference is concerned with the Crossroads of Humanity workshop which is part of the Environmental Hazards Assessment Program at the Medical University of South Carolina. This workshop was held during the months of June and July 1994. Topics discussed include: Radioactive contamination, aging, medical ethics, and environmental risk analysis.

2450 (DOE/EW/50625–T18-Vol.3) **Medical University of South Carolina Environmental Hazards Assessment Program: Deliverables: Volume 3, Annual report, July 1, 1993–June 30, 1994.** Medical Univ. of South Carolina, Charleston, SC (United States). 18 Aug 1994. 388p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE94019074. Source: OSTI; NTIS; INIS; GPO Dep.

This reference is concerned with the Crossroads of Humanity workshop which is part of the Environmental Hazards Assessment Program at the Medical University of South Carolina. This workshop was held during the month of June and July 1994. Topics discussed include: Perceived Risk Advisory Committee Meeting, surveys of public opinion about hazardous and radioactive materials, genetics,antibodies, and regulatory agencies.

2451 (IKE–4-137) **How free is the research sector?: Lectures.** Schmidt, F. (ed.). Stuttgart Univ. (Germany). Inst. fuer Kernenergetik und Energiesysteme. Jan 1993. 41p. (In German). (CONF-9301152–: Colloquium held in honour of Alfred Schatz on the occasion of his 65th anniversary, Stuttgart (Germany), 15 Jan 1993). Order Number DE95711707. Source: OSTI; NTIS (US Sales Only).

This brochure contains a number of lectures on the subject of university research, which is discussed by users from universities, state departments, and industry. All papers attempt to discuss the problem from an engineering point of view. The first issue discussed are the concrete conditions in which research can take place, especially in the field of energy. The final paper by Alfred Schatz presents some conclusions and consequences. (orig./UA)

2452 (INIS-mf–15019) **Technology for the future.** AGF Forschungsthemen, v. 71994. Arbeitsgemeinschaft der Grossforschungseinrichtungen (AGF), Bonn (Germany). 1994. 40p. (In German). Order Number DE95716125. Source: OSTI; NTIS (US Sales Only); INIS.

Sixteen research centres in the Federal German Republic are associated in the "Working Pool of Research Centres" (AGF). As national research centres these institutions engage in scientific-technical and biological-medical research and development based on interdisciplinary cooperation and intensive deployment of personnel, capital, and technical equipment. They make substantial contributions to state-promoted programmes in the following areas: energy research and technology; basic nuclear research; transport and traffic systems; aerospace research and polar research; data processing and applied computer science; environment protection and health; biology and medicine; and marine engineering and geosciences. The authors of this new volume of AGF topics deal with so-called key technologies, i.e., developments determining the direction of future activities. Topics relevant to energy are solar research and fusion research. (orig./UA)

9901 Management

Refer also to citation(s) 537, 828, 1050, 1410, 2537, 2576

2453 (DOE/EH–0419) **Safety and health five-year plan, Fiscal years 1995–1999.** USDOE Assistant Secretary for Environment, Safety, and Health, Washington, DC (United States). Oct 1994. 56p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002323. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes efforts by the Department of Energy (DOE) to size and allocate funding to safety and health activities that protect workers and the public from harm. Although it is well recognized that virtually every aspect of an operation has health and safety implications, this effort is directed at identifying planned efforts specifically directed at health and safety. The initial effort, to compile information for the period covering FY 1994–1998, served two primary needs: (1) to document what was actually taking place in the DOE Complex, from a budget and resource utilization standpoint (how the complex was reacting to the calls for greater protection for workers and the public); and (2) to embark on an effort to utilize forward-looking management plans to allocate resources to meet safety and health needs (to begin to be proactive). It was recognized that it would take several years to achieve full acceptance and implementation of a single, DOE-wide approach toward planning for safety and health, and to develop plans that emphasized the benefits from both risk management and accident prevention strategies. This report, describing safety and health plans and budgets for FY 1995, reflects the increasing acceptance of risk-based strategies in the development of safety and health plans. More operations are using the prioritization methodology recommended for the safety and health planning process, and more operations have begun to review planned expenditures of resources to better assure that resources are allocated to the highest risk reduction activities.

2454 (DOE/ET–0023) **Manual for ERLE (Energy-Related Laboratory Equipment): Instructions and information for institutions of higher leaning concerning used energy-related laboratory equipment grants.** USDOE Office of Science Education and Technical Information, Washington, DC (United States). Oct 1994. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002275. Source: OSTI; NTIS; GPO Dep.

This is a listing of energy related equipment available through the Energy-Related Laboratory Equipment Grant Program which grants used equipment to institutions of higher education for energy-related research. Information included is an overview of the program, how to apply for a grant of equipment, eligibility requirements, types of equipment available, and the costs for the institution.

2455 (DOE-HDBK–1078-94) **Training Program Handbook: A systematic approach to training.** USDOE, Washington, DC (United States). Aug 1994. 208p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018722. Source: OSTI; NTIS; GPO Dep.

This DOE handbook describes a systematic method for establishing and maintaining training programs that meet the requirements and expectations of DOE Orders 5480.18B and 5480.20. The systematic approach to training includes 5 phases: Analysis, design, development, implementation, and evaluation.

2456 (DOE-HDBK–3012-94) **Team leader's preparation guide for Operational Readiness Reviews (ORR).** USDOE, Washington, DC (United States). Sep 1994. 41p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001047. Source: OSTI; NTIS; GPO Dep.

This document provides instructions, explanations, and examples for the performance of all phases of an Operational Readiness Review (ORR). Details pertinent to the team leader, team members, and review coordinator are outlined. Sample forms and correspondence are included in appendices. Although this document is for use by DOE ORR team leaders, it can be used by contractor ORR team leaders also.

2457 (DOE/HR–0112) **Listing of awardee names: Active awards as of October 5, 1994.** USDOE Office of Procurement and Assistance Management, Washington, DC (United States). 5 Oct 1994. 671p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95001740. Source: OSTI; NTIS; GPO Dep.

This is a listing of awarded active contracts for all US DOE facilities and projects. The information contained in the list includes the awardee name and division responsible for the work, BIN, completion date, a one line description of the work, the vendor ID, city, state, congressional district, the value of the contract and the amount of funds expended to date.

2458 (DOE-STD–1077-94) **Training Accreditation Program Standard: Requirements and Guidelines.** USDOE, Washington, DC (United States). Aug 1994. 101p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94018723. Source: OSTI; NTIS; GPO Dep.

The Training Accreditation Program was established by DOE to assist in achieving excellence in developing and implementing performance-based nuclear facility training programs. This standard establishes the objectives and criteria against which the training programs for those DOE nuclear facilities listed in Attachment 1 to DOE Order 5480.18B are evaluated for accreditation. The standard also provides secretarial offices, operations/area offices, and contractor organizations with information and guidance that can be used to implement DOE Order 5480.18B.

2459 (DOE-TSL–1-94A) **Department of Energy standards index.** USDOE, Washington, DC (United States). Mar 1994. 105p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94019294. Source: OSTI; NTIS; GPO Dep.

This technical standards list provides listings of current and inactive DOE technical standards, non-Government standards that have been adopted by DOE, other Government documents in which DOE has a recorded interest, DOE site standards, and canceled DOE technical standards.

2460 (DOE-TSL–4-94A) **Directory of DOE and contractor personnel involved in non-government standards activities.** USDOE, Washington, DC (United States). Apr 1994. 143p. Sponsored by USDOE, Washington, DC (United States). Order Number DE94019293. Source: OSTI; NTIS; GPO Dep.

The policy in DOE Order 1300.2A is to encourage participation by DOE employees and contractors in activities of non-Government standards bodies to establish standards that serve national needs. OBM Circular A-119 requires Federal agencies to provide periodic reports on the level of agency participation in non-Government standards activities. This document is intended to assist DOE management and other personnel involved in the DOE Technical Standards Program by identifying those participating individuals.

2461 (GC–38/2) **The annual report for 1993.** International Atomic Energy Agency, Vienna (Austria). Jul 1994. 203p. Order Number DE95605238. Source: OSTI; NTIS (US Sales Only); INIS.

The present document highlights the activities of the IAEA in addressing the changing international environment in the areas of safeguards and verification, transfer of nuclear technology, and nuclear power and safety. Separate chapters describe the different areas of IAEA interests and the main achievements within individual programmes are recorded in the programme overviews at the start of each chapter.

2462 (GC–38/INF/3) **The Agency's technical co-operation activities in 1993: Report by the Director General.** International Atomic Energy Agency, Vienna (Austria). Aug 1994. 180p. Order Number DE95605237. Source: OSTI; NTIS (US Sales Only); INIS.

This document reviews the IAEA's Technical Cooperation activities for 1993. Apart from an overview, the report contains reviews by Agency programmes and technical divisions, by area, by component and by fund. Summaries of project implementation are also included, as well as indications of the achievements of projects completed in 1993.

2463 (HMI-B–521) **Hahn-Meitner-Institut Berlin. Annual report 1993.** Hahn-Meitner-Institut Berlin GmbH (Germany). 1994. 171p. (In German). Order Number DE95711376. Source: OSTI; NTIS (US Sales Only); INIS.

This report describes the activities of the Hahn-Meitner-Institute (HMI) on four special subjects: 1. Nuclear physics (nuclear reactions, nuclear structure, VICKSI accelerator development), 2. photochemical energy conversion (basic and material research, radiation chemistry), 3. structure research (theory of many-body systems, solid-state physics, neutron scattering, highly stressed metallic materials, trace nutrients in health and nutrition), and 4. information technics (software, real time systems, semiconductor subassembly). The following is presented for every special subject: (a) The topics worked on in 1993, (b) selected results and (c) publications, lectures, theses submitted for diplomas and doctoral theses. (orig.)

2464 (IAEA/NENP/TC–93/1, pp. 39-43) **Atucha 1 Nuclear Power Station.** Vicente Manzi, A. (Comision Nacional de Energia Atomica, Buenos Aires (Argentina)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document describes the training of personnel at the Atucha-1 reactor and the plans for recruiting and training personnel for the Atucha-2 reactor that is currently under construction.

2465 (IAEA/NENP/TC–93/1, pp. 45-59) **National programme and experience on training and qualification for nuclear plant personnel.** Najera, E.A. (Embalse NPS, Cordoba (Argentina)); Manzi, A. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document discusses the training provided to reactor operators at the Training Centro in Atucha and Embalse, describing also the selection of personnel and the role of the IAEA in training activities.

2466 (IAEA/NENP/TC–93/1, pp. 60-66) **Survey of programme and experience on training and qualification for nuclear power plant personnel in Belgium.** Michiels, H. (ELECTRABEL, Kallo (Belgium). Scaldis Training Centre). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document provides an overview of the qualifications on recruitment and the training activities of nuclear power plant personnel in Belgium. Each nuclear site has a training centre, and there are three full-scope simulators.

2467 (IAEA/NENP/TC–93/1, pp. 67-98) **Training and qualification of nuclear power plant personnel in Brazil.** Mathlas, S.G. (Furnas, Angra das Reis (Brazil). Nuclear Training Dept.). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

The Angra site has two training centres: the Angra 1 Training Centre and the Angra 2 simulator Training Centre. This document reviews briefly the training offered at each of the centres. Appendixes give the contents of the ten modules that comprise the classroom training of Angra-1 licensed operators; a typical program for the simulator requalification training of Angra-1 licensed operators; and a list of Furnas participation at international training courses from 1988 to 1992.

2468 (IAEA/NENP/TC–93/1, pp. 99-108) **The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview.** Thomas, R. (Atomic Energy Control Board, Ottawa, ON (Canada)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This article describes the facilities available in Canada for training the personnel of the CANDU-type reactors that operates in the country. The training offered is briefly described and the functions of the standing Inter-Utility/Regulatory Working Group are discussed.

2469 (IAEA/NENP/TC–93/1, pp. 109-121) **Programme and experience on training and qualification for nuclear power plant personnel in China.** Sun Guangdi (China National Nuclear Corp., Beijing, BJ (China). Div. of Operation Management). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This article discusses the training of nuclear power plant personnel in China. The Organizational structure of the training programme is presented, and the qualifications required of licensed reactor operators are detailed. 5 figs.

2470 (IAEA/NENP/TC–93/1, pp. 122-150) **The Czech Republic Nuclear Power Programme present situation and its development.** Kovar, P. (State Office for Nuclear Safety, Prague (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This article describes the current status of the nuclear power programme in the newly separated Czech and Slovak Republics, discussing legislative procedures and staff training. The qualifications of recruited staff are detailed and training and quality assurance activities are reviewed.

2471 (IAEA/NENP/TC–93/1, pp. 151-154) **Finnish programme and experience on training and qualification for nuclear power plant personnel.** Aro, I. (Finnish Centre for Radiation and Nuclear Safety (STUK), Helsinki (Finland)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This article describes briefly the training units at the two nuclear power plant sites in Finland. The power companies have developed job-specific training programmes based on an analysis of the training needs in each job important to nuclear safety. 6 refs.

2472 (IAEA/NENP/TC–93/1, pp. 155-161) **A few guidelines for improving the operating safety of nuclear power plants.** Billard, P. (Electricite de France (EDF), Paris (France). Generation and Transmission Training Dept.). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

The various analyses of safety-related problems show that the leading source of progress involves the men and women working for the company. The concept of professionalism developed by EDF leaves room for the initiative and responsibility necessary for motivation, while retaining the rigorous approach required for operating nuclear power plants. This document describes the maintenance training structure implemented within this context, its goals and its organization.

2473 (IAEA/NENP/TC–93/1, pp. 162-170) **Referential approach.** Billard, P. (Electricite de France (EDF), Paris (France). Generation and Transmission Training Dept.). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

The following method for preparing a specific training program for a given trade can be applied to every level (technical, administrative, management, etc.) and at every organizational level. The process is based on a quality-oriented approach: strict application of a methodology, structured organization and involvement of all participants. The recommended methodology is based on three main phases: For each trade, define a "trade referential" based on task analysis; from this, deduce the training objectives, thus defining the "training referential"; prepare the training plan, write the specifications for the different sessions and then prepare the teaching materials.

2474 (IAEA/NENP/TC–93/1, pp. 171-183) **German system for training and qualification of NPP-personnel.** Grauf, E. (Gemeinschaftskernkraftwerk Neckar GmbH, Esslingen (Germany)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document summarizes the essential qualifications of nuclear power plant personnel in Germany and describes the programmes used for their training and retraining.

2475 (IAEA/NENP/TC–93/1, pp. 184-194) **The German center for the simulator training of nuclear power plant personnel.** Hoffmann, E. (KSG Kraftwerks-Simulator GmbH, Essen (Germany)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document describes the organization and objectives of the German Centre for Simulator Training.

2476 (IAEA/NENP/TC–93/1, pp. 195-205) **Preparation and conduct of simulator training in Germany.** Hoffmann, E. (KSG Kraftwerks-Simulator GmbH, Essen (Germany)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

Simulator training for nuclear power plant operators in Germany is conducted in a simulator center in Essen. The center is equipped with four simulators, a fifth one is under construction and at least four more simulators are under consideration. This institution serves 23 nuclear power plant units in Germany, Switzerland (NPP Goesgen-Daeniken) and the Netherlands (NPP Borssele) and trains 1.300 persons per year. As a common enterprise the company is owned by 13 utilities, which leads to the necessity to prepare common rules and guidelines for simulator specification, training of instructors, assessment of trainees, training material and - as subjects of this paper - courses and their preparation and conduct. This paper discusses the main elements of the preparation and conduct of simulator training courses which are heavily influenced by authorities' guidelines, operational results and experiences from the actual plant and by the trainee's individual needs. A typical training course development will serve as the central theme for this presentation. 4 figs.

2477 (IAEA/NENP/TC–93/1, pp. 206-219) **Training for qualification and competence of nuclear power plant personnel in India.** Prasad, Y.S.R. (Nuclear Power Corp. of India Ltd., Bombay (India)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

The role of human resources in nuclear power plant operations can not be over emphasized . The Indian Department of Atomic Energy, having achieved self reliance in its manpower development programs, now faces a different challenge: the long term planning has to meet the needs not only of the operating units, but also of the new projects. Additionally the increasing requirements in scope of training as well as the new technologies introduced call for plans to develop manpower with a special strategy. This paper describes briefly the training offered to nuclear power plant personnel in India. 6 figs, 2 tabs.

2478 (IAEA/NENP/TC–93/1, pp. 220-230) **Education and training program at Hamaoka Nuclear Power Station.** Ando, Yoshikazu (Chubu Electric Power Co., Inc., Ogasa, Shizuoka (Japan). Hamaoka Nuclear Power Station). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

There are 9 major electric power companies in Japan and Chubu Electric Power Co., Inc. is the third largest among them. Chubu has only one nuclear power station, Hamaoka Nuclear

Power Station, where 3 BRW plants are in operation and the 4th unit is under construction and scheduled to begin commercial operation in this September. This paper describes the Chubu's education and training system as an example of those of Japanese utilities and mainly deals with education and training for nuclear power plant personnel. 5 tabs.

2479 (IAEA/NENP/TC–93/1, pp. 231-252) **Training for the qualification and competence of nuclear power plant personnel in Mexico.** Alvaradao, F.B. (Central Nucleoelectrica Laguna Verde (Mexico)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document describes the training of Laguna Verde Nuclear Power Plant Personnel, from recruitment and screening, through training to retraining to maintain the necessary skills and qualifications.

2480 (IAEA/NENP/TC–93/1, pp. 253-272) **System for training and qualification of nuclear power plant personnel in Pakistan.** Siddiqui, A.A. (Karachi Nuclear Power Training, Karachi (Pakistan)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document briefly summarizes the training provided to nuclear power plant personnel in Pakistan. Initial training, on-the-job training and retraining are all considered.

2481 (IAEA/NENP/TC–93/1, pp. 273-290) **Russian programme and experience on nuclear power plant personnel training system development.** Saakov, E.S. (Atomtechenergo, Moscow (Russian Federation)); Kucherenko, A.A. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

Training of nuclear power plant personnel in Russian has traditionally been based on a high level of basic education and subsequent practical training at a nuclear power plant. This document reviews the organization of reactor personnel training and the nature of the training courses. 10 figs.

2482 (IAEA/NENP/TC–93/1, pp. 291-355) **Spanish national programme and experience on training and qualification for nuclear power plant personnel.** Alarco, F.M. (TECNATOM SA, Madrid (Spain)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

The Spanish nuclear power plants are themselves responsible for personnel training, and the training programmes are prepared directly by the plants. Training is coordinated by the training group at each plant and given by this group, by plant technical staff or by external contractors. Different training techniques are used, and these are summarized in the present article, which includes also a discussion of problems detected and their solutions. Detailed annexes describe current trends in training simulators and an interactive graphic simulator. 9 figs.

2483 (IAEA/NENP/TC–93/1, pp. 356-362) **Training for the qualification and competence of nuclear power plant personnel in Sweden.** Persson, P.E. (KSU Nuclear Training and Safety Center, Nykoeping (Sweden)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This document describes the Swedish Nuclear Training and Safety Centre, KSU, which provides centralized training in full scope, replica simulators to all the Swedish nuclear facilities. Also discussed is the Swedish implementation of the Systematic Approach to Training.

2484 (IAEA/NENP/TC–93/1, pp. 363-372) **Conception to create the system for psychophysiological maintenance of operators' labor in power plants.** Karpenko, A. (Academy of Science of Ukraine, Kiev (Ukraine). Inst. for Occupational Health). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This article stresses the importance of human factors in the safety of nuclear power plants and proposes a psychophysiological monitoring of reactor personnel to ensure that all staff are not just sufficiently trained to perform their duties correctly but are also always able to do so.

2485 (IAEA/NENP/TC–93/1, pp. 373-389) **The UK programme and experience on training and qualification for nuclear power plant personnel.** Ross, W.M. (Health and Safety Executive, Bootle (United Kingdom). Nuclear Installations Inspectorate). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This paper contains a brief description of the regulation and practices in the UK for the training and qualification of nuclear power plant personnel. An attempt has been made to identify areas for development at each stage of the training process. An appendix gives an extract related to training from the Nuclear Electric Production Directive on Arrangements for Nuclear Site License.

2486 (IAEA/NENP/TC–93/1, pp. 390-394) **Training for the qualification and competence of nuclear power plant personnel in the United States.** Bruno, R. (Exitech Corp., Green Bay, WI (United States)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9302195–: IAEA review meeting on training for the qualification and competence of nuclear power plant personnel, Vienna (Austria), 22-26 Feb 1993). In *Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993.* 401p. Order Number DE95605239. Source: OSTI; NTIS (US Sales Only); INIS.

This article discusses very briefly the accredition of nuclear training programmes in the USA.

2487 (IAEA/NENP/TC–93/2, pp. 27-65) **Assistance to nuclear power user countries under the IAEA Technical Cooperation Programme.** Samiei, M. (International Atomic Energy Agency, Vienna (Austria). Div. of Technical Co-operation Programmes). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet

Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document gives the infrastructure of Division of Technical Cooperation in IAEA. It informs about the purpose and functions of Middle East and Europe Section of this division.

2488 (IAEA/NENP/TC–93/2, pp. 80-83) **Interregional and regional training courses 1994.** International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document gives a list of various training programmes planned for the year 1994, in different fields of nuclear industry. These are interregional and regional courses in nuclear power, nuclear safety, radiation protection, nuclear fuel cycle and waste management, physical and chemical sciences and instrumentation, human health, food and agriculture and environment.

2489 (IAEA/NENP/TC–93/2, pp. 84-85) **[Technical Cooperation programmes organized by Division of Nuclear Power].** Boothroyd, A. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

The basic mission of the Division of Nuclear Power is to support operating plants and other organizations in Member States which have or are planning nuclear power programmes. We have a number of programmes within the Nuclear Power Engineering Section which are related to enhancing cooperation among member States in key areas related to nuclear power, including the training of nuclear power plant personnel. These activities support safe, reliable and economic nuclear power plant operations and maintenance, and our section provides technical input for many Technical Cooperation projects in developing countries.

2490 (IAEA/NENP/TC–93/2, pp. 86-89) **IAEA activities in nuclear power plant personnel training and qualification.** Mautner-Markhof, F. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

Training to achieve and maintain the qualification and competence of nuclear power personnel is essential for safe and economic nuclear power. Technical Cooperation Meeting on Training-Related Activities for Nuclear Power Plant (NPP) Personnel in the countries of Central and Eastern Europe (CEEC) and of the former Soviet Union (FSU) has as its main objective the identification, through information exchange and discussion, of possible Technical Cooperation (TC) projects to assist Member States in meeting NPP personnel training needs and priorities, including the enhancing of training capabilities.

2491 (IAEA/NENP/TC–93/2, pp. 90-107) **Training-related infrastructure development and evaluation of training performance.** Rao, K.V.M. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

Division of Nuclear Power provides training to its member States through courses and workshops, covering different aspects of nuclear power plant operation. This document discusses uses, methodology and evaluation of effectiveness of these training programmes.

2492 (IAEA/NENP/TC–93/2, pp. 108-122) **Quality assurance technical cooperation and training.** Chen, C.K. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

An IAEA Manual (TRS 340) which provides guidance for establishing training programme covering Quality Assurance principles and practices was published in 1992. The document is mainly based on the experience and material collected through the performance of some 50 interregional, regional and national training courses, seminars and workshops on Quality Assurance organized by the IAEA in about 20 countries. The purpose of this document is to provide a systematic approach for use by the responsible management in developing an overall QA training programme and lecture material for all personnel of a nuclear power plant. The document can be suitably adjusted for various management levels and adapted to the national variables and needs.

2493 (IAEA/NENP/TC–93/2, pp. 123-131) **IAEA programmes on the safety of nuclear power plants in Easter Europe and countries of the former Soviet Union.** Lederman, L. (International Atomic Energy Agency, Vienna (Austria)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

A nuclear power plant should meet international safety standards otherwise, it should be shut down as soon as possible. But this is not a practical solution for the reactors operating in eastern Europe. This document indicates the role played by IAEA in assisting these countries to improve safety standards of their reactors. IAEA programmes have international expertise, therefore, they are very useful guidelines for nuclear safety decisions. IAEA also plays an important role in bilateral and multilateral assistance programmes.

2494 (IAEA/NENP/TC–93/2, pp. 142-149) **Training related activities.** Tomic, B. (International Atomic Energy Agency, Vienna (Austria). Div. of Nuclear Power). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the*

countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993. 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document presents different methods adopted for plant safety analysers. Aim is to transfer knowledge to experts. Various training courses are arranged for the purpose.

2495 (IAEA/NENP/TC–93/2, pp. 162-187) **Presentation of the G-24 technical working group on training.** Haber, S. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

The Technical Working Group on Training (TWG-T) was created during the Plenary Session of September 1992 in order to inform the Members on ongoing activities in the Nuclear Training field, define redundancies and gaps of the "Assistance Programs", and propose efficient ways to progress. Training was recognized as one major activity through which operational safety can be very effectively and quite quickly improved and therefore the Plenary Session unanimously decided to launch a TWG on the subject. The present report is issued one year after the creation of the TWG. It summarizes the major steps of the activities and presents the relevant results. It also contains copies of documents on training infrastructures and requirements, provided by the recipient countries during the course of the work.

2496 (IAEA/NENP/TC–93/2, pp. 188-201) **Implementation of systematic training approach in Kozloduy Training Centre - Current situation. Presentation of Bulgaria.** Kosturkov, L. (Nuclear Power Plant Kozloduy, Kozloduy (Bulgaria). Training Centre). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

To identify the needs in implementation of the systematic training approach, a relation between the number of trainees, duration of the training and the type of training should be made. In other hand, as it was stated in the TWG-T(93) Status Report, in order to be better identified outstanding training needs, the existing capabilities and other related projects should be taken into account. This report is pointed to give more details for the current situation in Bulgaria and to clarify the needs of international assistance. 3 refs, 3 tabs.

2497 (IAEA/NENP/TC–93/2, pp. 202-203) **Training of nuclear power plant personnel in Canada.** Tennant, D. (Atomic Energy Control Board, Ottawa, ON (Canada)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

All of the utilities, Ontario Hydro, Hydro Quebec and New Brunswick Power, operating Nuclear Power Plants in Canada have Training Centres which provide training for all of their plant personnel whose job activities could affect plant and personnel safety. This report points out the methods used for training, which generally conform to that described by the IAEA as a Systematic Approach to Training (SAT).

2498 (IAEA/NENP/TC–93/2, pp. 204-212) **The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview.** Thomas, R. (Atomic Energy Control Board, Ottawa, ON (Canada)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This report gives the history of training programmes for reactor operation personnel in Canada. With increased experience in reactor operation and awareness of reactor safety, more importance is given to the selection of a candidate and his training as control room operator or shift supervisor.

2499 (IAEA/NENP/TC–93/2, pp. 212-236) **The Czech Republic programme and experiences on training and qualification for NPPs personnel.** Kovar, P. (State Office for Nuclear Safety, Prague (Czech Republic)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

The nuclear power programme in Czech Republic is based on commercial use of WWER-type reactors. This document discusses future scope of nuclear programme in Czech Republic and status of training programme for NPP personnel.

2500 (IAEA/NENP/TC–93/2, pp. 237-247) **Cooperation with CIS in training of NPP-Personnel. (Supported by German Government and European Community).** Gronau, D. (Siemens AG Unternehmensbereich KWU, Karlstein (Germany)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This is a report on training of reactor control personnel in Germany. It gives structure and objective of training projects for Kola and Rovno reactors units. 10 figs.

2501 (IAEA/NENP/TC–93/2, pp. 248-256) **Presentation of Germany.** Leinauer, A. (Kernkraftweks Betriebsgesellschaft, Gundremmingen (Germany)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This report presents the organization chart of Gundremmingen Nuclear Power Station in Germany. In this plant shiff supervisors and reactor operators undergo training at various levels depending on their job requirements.

2502 (IAEA/NENP/TC–93/2, pp. 257-272) **Description of training activities and re-training system for nuclear professionals at the Paks Nuclear Power Plant, Hungary.** Jambrich, I.; Trampus, P. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

The nuclear power units of Paks, Hungary, have always been operated by Hungarian personnel, from the very beginning. The operator staff of unit 1 acquired its knowledge primarily outside of the country, but since 1983 the overall training process has been run entirely in Hungary, in Paks. This report gives details of present system of training programme in Hungary. The system of training for professionals builds up in vertically linked modules and is job oriented. It begins with theoretical training, followed by programmed on-the-job training which must successfully be finished before a release onto in-company or authority licensing exams for individual job performance.

2503 (IAEA/NENP/TC–93/2, pp. 273-277) **Briefing notes on Kazakhstan.** International Atomic Energy Agency, Vienna (Austria); International Atomic Energy Agency, Vienna (Austria). Div. of Technical Co-operation Programmes. 1993. (CONF-9310353–: IAEA Technical Committee meeting: use of diagnostic systems to monitor performance and reliability of safety equipment, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document gives an overview of nuclear activities and atomic energy related infrastructure of Kazakhstan. Former USSR norms, standards and codes of practice are used in Kazakhstan. Assistance and training are seeked for radiation protection and handling problems due to radioactive contamination.

2504 (IAEA/NENP/TC–93/2, pp. 278-313) **Training and qualification of NPP personnel in Romania.** Casota, M.V. I. (Nuclear Power Group RENEL, Bucharest (Romania). Human Resources Management Dept.). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

Romanian nuclear program is completed with a nuclear fuel manufacturing plant, heavy water production plant and major organizations for engineering, manufacturing and erection of systems and components. Systematic Approach to Training, recommended by IAEA-TECDOC-525, has been started to gradually incorporate the current available training programs. 12 figs.

2505 (IAEA/NENP/TC–93/2, pp. 314-327) **Cernavoda NPP operations training programs.** AECL-ANSALDO Consortium, Cernavoda NPP Unit 1. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

The purpose of this document is to describe the philosophy, content and minimum requirements for the Cernavoda Training Programs for all Station staff and to identify the training department organization and respective responsibilities necessary to provide the required training. The hierarchical documentation and requirements related to these programs is shown in figure Rd-TR1-1.

2506 (IAEA/NENP/TC–93/2, pp. 328-337) **Information on the projects of technical assistance in personnel training for Russian NPPS. Presentation of Russia.** Kovalyov, A. (Novovoronezh Training Centre (Russian Federation)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document is a review of the projects in effect which are rendering technical assistance in the area of personnel training for Russian NPPs. These projects are implemented by experts from Japan, Belgium, Spain, France and Great Britain. A bilateral agreement was signed between Russian and Japanese governments on development of a full-scope simulator for WWER-320.

2507 (IAEA/NENP/TC–93/2, pp. 338-346) **ENIKO MIFI theses for discussion on implementation of training assistance.** Kucherenko, A.A. (ENIKO-MIFI, Moscow (Russian Federation)); Kazennov, A.Yu. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

One of the important roles of the IAEA is to assist countries on technical co-operation on training personnel in various fields of nuclear power plant operation. This document presents considerations and recommendations concerning recipient countries needs in the improvement of training system. 3 tabs.

2508 (IAEA/NENP/TC–93/2, pp. 347-375) **System of NPP personnel training in Slovak Republic.** Duchac, A.; Dugovic, M.; Ziakova, M. International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This document presents the status of nuclear energy compared to other energy sources in Slovakia and training of nuclear power plant personnel.

2509 (IAEA/NENP/TC–93/2, pp. 376-389) **Tecnatom training program. Presentation of Spain.** Campo, F. (TECNATOM SA, Madrid (Spain)). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

This report gives important branches of nuclear power plants in Spain and the training programmes for the personnel working there.

2510 (INIS-JP–024, pp. A020/1-A020/10) **Highlights of IAEA activities in the field of radiation application.** Machi, S. (International Atomic Energy Agency, Vienna (Austria). Dept. of Research and Isotopes). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

In IAEA's major programme of Nuclear Applications, the activities performed are divided into four areas: food and agriculture, industry and earth science, human health, and physical and chemical sciences. These activities involve co-operation with FAO, WHO, UNIDO and UNEP, and have close link with the technical assistance programme. About 60% of the technical assistance projects are implemented in the field of nuclear applications. The purpose of the nuclear application programme is to develop technologies useful for environmental protection and sustainable development, to support R and D programmes of developing countries, to develop new applications of nuclear techniques. Major activities in food and agriculture are the application of radiation and isotopes, controling insects, preserving food, soil fertility and crop production, and improving animal production and the use of radiation with biotechnology for plant mutation breeding aiming at environmentally friendly and sustainable food production. In the human health programme emphasis is given to nuclear medicine, cancer therapy and nutrition. Today, only 35% of all developing countries have radiotherapy facilities. Activities, therefore, focus on strengthening clinical radiotherapy in such countries. In the field of industry and earth science, flue gas cleaning by electron beams, pollution monitoring using nuclear analytical techniques, nucleonic control systems for industries, and water resource exploration are major projects assisting developing countries. As of 1994 the IAEA will launch 12 new and promising Model Projects for developing Member States which will be of benefit to their economies and raising of their standard of living. In this paper the highlights of the above mentioned IAEA activities are presented. (author).

2511 (INIS-JP–024, pp. A320/1-A320/11) **Development of radiation utilization for economic growth in China.** Lu Yanxiao (China Nuclear Information Center, Beijing, BJ (China)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

The program of radiation utilization in China was initiated with the development of nuclear industry in the late 1950s. From then on, the establishment of relatively comprehensive nuclear industrial system and a fair number of talent technical personnel have laid the foundation for radiation utilization in industry, agriculture, medicine and so on. Radioisotopes and radiation become one of the most effective means for acquiring data and information and changing material properties in modern techniques. They are, in many respects, unique and cannot replaced by other techniques. In recent years the considerable progress in the development, commercialization and large-scale utilization of radioisotopes and radiation has been creating economic and social benefits for Chinese modernization. The applications in agriculture have mainly embodied in mutation breeding of crops and so on through radiation or in combination with other methods to provide excellent mutant varieties. The important applications in medicine are the medical diagnosis with radioimmunoassay (RIA) and radiopharmaceutical imaging, and cancer therapy with radioisotopes and electron beam. Well-established methods have bee offered for routine clinic applications to help to heal the patients and rescue the lives. The industrial applications are of key importance in economic growth in China. In fact, radiation processing and nucleonic control systems (NCS) for industrial utilization are very useful to technological transformation of Chinese traditional industries. The radiation utilization in industries can be emerging as new high-tech industries. A fuller exploitation of radiation utilization is expected to meet the requirements of high growth of national economy and to bridge the gap between China and the developed countries in the world in nuclear application. (author).

2512 (INIS-JP–024, pp. A330/1-A330/12) **Present status of radiation utilization in Thailand.** Chongkum, S. (Office of Atomic Energy for Peace, Bangkok (Thailand)). Japan Atomic Industrial Forum, Inc., Tokyo (Japan); Japan Radioisotope Association, Tokyo (Japan); Atomic Energy Society of Japan, Tokyo (Japan). 1994. 596p. (CONF-940268–: 21. Japan conference on radiation and radioisotopes, Tokyo (Japan), 2-4 Feb 1994). In *Proceedings of the 21st Japan conference on radiation and radioisotopes: The 100th year since the discovery of X-ray, and expectation to the future development.* Order Number DE94785275. Source: OSTI; NTIS; INIS.

Present development of radiation utilization in Thailand covers two main areas, i.e. (1) production and utilization of radioisotopes and (2) radiation processing and technology. Radioisotope production from 2 megawatts Thai Research Reactor (TRR1/M1) is being studied, directed toward expanding the varieties of radioisotopes, improvement of quality, and technological development on quantity producing to meet the total national needs. However a large amount of radioisotopes is also imported mainly for industrial and medical applications. Radioisotopes and radiations are utilized in nuclear medicine for diagnosis and therapy from 30 hospitals and institutions. X-ray photographing, X-ray computer tomography and others are typical use for medical examination purposes, while Co-60 gamma rays and electron beam are in used for curing. Since 1972, Thailand has been participated to the IAEA/RCA Industrial Project, through the liaison of the Office of Atomic Energy for Peace (OAEP), and increases the awareness of industry to the economic benefits through the uses of nuclear technology. More than 60 companies are using radioisotopes for gauging, examination purposes and production controls, while these radioisotopes are mostly imported. Nuclear techniques in agriculture are addressed concerns with optimizing fertilizer application, determination soil-water-nitrogen fixation relationships, improving animal health and reproduction, measurement of toxic residues, appropriated food preservation techniques and breeding plant for better yield and disease resistance. The eradication of fruit flies by Sterile Insect Technique (SIT) with gamma rays has been successfully applied in northern and middle part of Thailand. The progress and present status of radiation utilization and processing in Thailand will be introduced. (author).

2513 (INIS-mf–14358) **Environment, 1980-1993: International Atomic Energy Agency publications.** International Atomic Energy Agency, Vienna (Austria). Jan 1994. 42p. (SUBJ/CAT–1993/ENV.). Order Number DE95605240. Source: OSTI; NTIS (US Sales Only); INIS.

This document lists all sales publications of the International Atomic Energy Agency dealing with Environment issued during the period 1980-1993. It gives a short abstract and contents of these issues along with their costs in Austrian Schillings.

2514 (INIS-mf–14359) **Nuclear power, nuclear fuel cycle and waste management, 1980-1993: International Atomic Energy Agency publications.** International Atomic Energy Agency, Vienna (Austria). Jun 1994. 134p. (SUBJ/CAT–1993/NPCW.). Order Number DE95605241. Source: OSTI; NTIS (US Sales Only); INIS.

This document lists all sales publications of the International Atomic Energy Agency dealing with Nuclear Power, Nuclear Fuel Cycle and Waste Management, issued during the period 1980-1993. It gives a short abstract of these publications along with contents and their costs in Austrian Schillings.

2515 (KTM/E-C–41) **Nuclear energy research until 2000: The necessity of the nuclear energy research until the year 2000 and a proposal for the organizational model of the research.** Reiman, L. (Finnish Centre for Nuclear and Radiation

Safety, Helsinki (Finland)); Rintamaa, R.; Vanttola, T. Ministry of Trade and Industry, Helsinki (Finland). Energy Dept. Mar 1994. 73p. (In Finnish). Order Number DE95606992. Source: OSTI; NTIS; INIS.

The working group was to assess the need and orientation of nuclear energy research (apart from research on nuclear waste management and fusion technology) up until the year 2000 in Finland and to propose framework schemes and organization guidelines for any forthcoming publicly financed research programmes from 1995 onwards. The main purpose of nuclear energy research is to ensure the safety and continued development of Finland's existing nuclear power plants. Factors necessarily influencing the orientation of research are Parliaments decision of late 1993 against further nuclear capacity in the country, the need to assess reactor safety in the eastern neighbour regions, and Finland's potential membership in the European Union. The working group proposes two new research programmes similar to the current ones but with slightly modified emphasis. Dedicated to reactor safety and structural safety respectively, they would both cover the four years from 1995 to 1998. A separate research project is proposed for automation technology. In addition, environmental research projects should have a joint coordination unit. (9 figs., 4 tabs.).

2516 (LA-UR–94-3184) **Re-engineering facilities management at Los Alamos: Managing the behavioral change.** Crider, S.A.; van der Hoeven, B.J. Los Alamos National Lab., NM (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9411134–1: IFMA '94, St. Louis, MO (United States), 6-9 Nov 1994). Order Number DE95000915. Source: OSTI; NTIS; GPO Dep.

The Los Alamos National Laboratory is a multi-program research and development laboratory operated by the University of California for the Department of Energy. The laboratory was founded in 1943 as part of the Manhattan Project. The laboratory has major programs in nuclear weapons technology, non-nuclear defense, environmental preservation and restoration, health and biotechnology, and other areas of national importance. Today the laboratory's vision is to be a world class laboratory solving complex problems of national importance where science makes a difference. The laboratory will continue its special role in defense, particularly in nuclear weapons technology, and will increasingly use its multi-disciplinary capabilities to solve problems in the civilian sector. Recognizing the changing environment, major strides are being made in collaborations with US industry. Over 70 Cooperative R&D Agreements (CRADA's) are in progress and more than 15 separate spin-off companies have been created. The nuclear weapons program is responding to new priorities with increased emphasis on weapons dismantlement, control of proliferation, emphasis on development of technologies that can have dual use (both defense and commercial) as well as continuing stewardship of the existing stockpile. The laboratory has a strong tradition of ownership of its products from "cradle to grave," and this tradition bodes well for the future as it becomes more externally market driven.

2517 (OUP–94-14) **Section for nuclear physics and energy physics - Annual report: January 1 - December 31, 1993.** Oslo Univ. (Norway). Fysisk Inst. Aug 1994. 134p. Order Number DE95606993. Source: OSTI; NTIS; INIS.

This annual report summarizes the research and development activities of the Section for Nuclear Physics and Energy Physics at the University of Oslo in 1993. It includes experimental and theoretical nuclear physics, as well as other fields of physics in which members of the section have participated. The report describes completed projects nd work currently in progress. As in previous years, the experimental activities in nuclear physics have mainly been centered around the Cyclotron Laboratory with the SCANDITRONIX MC-35 Cyclotron. Using the CACTUS multidetector system, several experiments have been completed. Some results have been published while more data remains to be analyzed. In experimental nuclear physics the section staff members are engaged within three main fields: nuclei at high temperature, high spin nuclear structure and high and intermediate energy nuclear physics. In theoretical physics the group is concerned with the many-body description of nuclear properties as well as with the foundation of quantum physics.

2518 (WHC-SP–1106) **Financial services FY 1995 site support program plan WBS 6.10.4.** Vodney, E.P. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 125p. DOE Contract AC06-87RL10930. Order Number DE95001841. Source: OSTI; NTIS; GPO Dep.

This is the signed Financial Service fiscal year 1995 Site Support Program Plan, Work Breakdown Structure 6.10.4, for the Hanford site. This plan is intended to enable the contractor to accomplish the following: ensure financial integrity in all Westinghouse Hanford Company (WHC) operation while supporting the programmatic activities of WHC, the US Department of Energy, Richland Operations Office, and other Hanford contractors; provide efficient and effective financial services, and value added audits and review that enable management to enhance future operational results.

2519 (WHC-SP–1109) **Budget FY 1995 site support program plan WBS 6.10.1.** Wemhoff, G.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001316. Source: OSTI; NTIS; GPO Dep.

This is the program plan of Budget for the fiscal year 1995 site support. The topics of the program plan include a general mission statement, the primary customers, major activities performed to deliver products and services, program priorities, goals and objectives, assumptions, issues and constraints, performance measures, work breakdown structure and responsibility assignment matrix, description of activities and milestone list.

2520 (WHC-SP–1122-Vol.1) **Site Support Program Plan for ICF Kaiser Hanford Company.** Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 307p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002837. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. Contained in this Volume I is introductory information covering the following: Management support; president's office; communications office; legal department; strategic initiatives; organizational development; administration division including management, project planning, finances, human resources, cost estimating; management assessment; labor relations.

2521 (WHC-SP–1122-Vol.2) **Site Support Program Plan for ICF Kaiser Hanford Company.** Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 239p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002838. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. Contained in this Volume II is information covering the following: Operations and maintenance Utilities; Piped Utilities; Water systems Administration and Sampling; electrical utilities.

2522 (WHC-SP–1122-Vol.3) **Site Support Program Plan for ICF Kaiser Hanford Company.** Benedetti, R.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 185p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002839. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Hanford Reservation site support program plan for each support division, in terms of safety, environmental concerns, costs, and reliability. Support services include the following: Piped Utilities; Electrical utilities; transportation; Energy management; General Administration Support Buildings; electrical safety upgrades. This Volume III discusses Operations and Maintenance Transportation and the Transportation Department including fleet maintenance, railroad operations and track maintenance, bus

operations, solid waste disposal, special delivery services, and road maintenance.

2523 (WHC-SP–1127) **Work management administration FY 1995 site support program plan WBS 6.2.** Hale, N.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95001580. Source: OSTI; NTIS; GPO Dep.

Westinghouse Hanford Company's (WHC) near-term vision is to implement a Site-wide work management program that is consistent from one facility to the other, and can realize workforce efficiencies, minimum down time, and familiarization with facilities uniqueness. Additionally, consistent Hanford Site work management processes can produce meaningful information to be shared complex-wide as the US Department of Energy (DOE) cleans up facilities Site-wide. It is the mission of the WHC Work Management Administration Program to provide guidance and program direction on how to implement consistent and effective work management across the Hanford Site that comply with the DOE and other regulatory requirements. This report describes the steps needed to implement a work management plan at Hanford.

9902 Mathematics and Computers

Refer also to citation(s) 188, 204, 208, 239, 258, 271, 281, 342, 406, 562, 564, 747, 767, 801, 802, 803, 820, 877, 997, 1015, 1022, 1038, 1046, 1139, 1155, 1210, 1288, 1427, 1432, 1433, 1443, 1444, 1447, 1448, 1451, 1452, 1460, 1462, 1475, 1476, 1477, 1535, 1586, 1678, 1684, 1697, 1698, 1716, 1718, 1719, 1721, 1722, 1723, 1725, 1728, 1729, 1733, 1734, 1735, 1736, 1737, 1738, 1794, 1795, 1796, 1804, 1827, 1850, 1864, 1906, 1947, 1973, 2026, 2027, 2277, 2278, 2280, 2346

2524 (ANL/MCS/CP–84282) **Solutions of TEAM Problem No. 13 using integral equations in a sequential and parallel computing environment.** Kettunen, L. (Tampere Univ. of Technology (Finland). Laboratory of Electricity and Magnetism); Forsman, K.; Levine, D.; Gropp, W. Argonne National Lab., IL (United States). [1993]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9311255–1: 4. international TEAM workshop, Miami, FL (United States), 5-6 Nov 1993). Order Number DE95001472. Source: OSTI; NTIS; GPO Dep.

In this paper a brief discussion of h-type volume integral formulations implemented in GFUNET/CORAL code is given and solutions of TEAM benchmark No. 13 are shown. GFUNET/CORAL is a general purpose code for 2D and 3D magnetostatics. Solutions of TEAM problem No. 13 are computed using both a sequential and parallel version of GFUNET/CORAL.

2525 (ANL/MCS/CP–84283) **Solutions of TEAM problems 13 and 20 using a volume integral formulation.** Kettunen, L. (Tampere Univ. of Technology (Finland)); Forsman, K.; Levine, D.; Gropp, W. Argonne National Lab., IL (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9407140–1: Aix-les-Baines TEAM workshop, Aix-les-Baines (France), 7-8 Jul 1994). Order Number DE95001845. Source: OSTI; NTIS; GPO Dep.

Solutions for TEAM benchmark problems 13 and 20, obtained with an h-type volume integral formulation, are presented. Results computed with an increasing number of unknowns are shown in order to study the convergence of the numerical calculations. Some theoretical questions and aspects of parallelism are also highlighted.

2526 (ANL/MCS/PP–72994) **Stable parallel elimination for boundary valve ODEs.** Wright, S.J. Argonne National Lab., IL (United States). Mathematics and Computer Science Div. Apr 1991. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95001450. Source: OSTI; NTIS; GPO Dep.

A parallelizable and vectorizable algorithm for solving linear algebraic systems arising from two-point boundary value ODEs is described. The method is equivalent to Gaussian elimination, with row partial pivoting, applied to a certain row- and column-reordered version of the usual almost block-diagonal coefficient matrix. Analytical and numerical evidence is presented to show that the algorithm is stable. Results from implementation on a shared-memory multiprocessor and a vector processor are given. The approach can be extended to handle problems with multipoint and integral conditions or algebraic parameters.

2527 (ANL/MCS/PP–75185) **A worse-case example using linesearch methods for numerical optimization with inexact gradient evaluations.** Carter, R.G. (Univ. of Minnesota, Minneapolis, MN (United States). Army High Performance Computing Research Center). Argonne National Lab., IL (United States). Mathematics and Computer Science Div. [1994]. 7p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Grant DAAL03-89-C-0038. Order Number DE95002917. Source: OSTI; NTIS; GPO Dep.

Two approaches often used to improve the robustness of numerical optimization algorithms are linesearch and trust region methods. Trust region methods have previously been shown to be extremely forgiving of high levels of noise and inaccuracy in gradient evaluations. The authors present a worst-case example demonstrating that linesearch methods can be very fragile with respect to such noise.

2528 (ANL/MCS/PP–75731) **A divide-and-conquer method for tridiagonalizing symmetric matrices with repeated eigenvalues.** Bischof, C.H.; Sun, X. Argonne National Lab., IL (United States). Mathematics and Computer Science Div. [1994]. 13p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DM28E04120. Order Number DE95002918. Source: OSTI; NTIS; GPO Dep.

The authors describe a divide-and-conquer tridiagonalization approach for matrices with repeated eigenvalues. The algorithm hinges on the fact that, loosely speaking, a symmetric matrix with bandwidth b and k distinct eigenvalues must be block diagonal with diagonal blocks of size at most bk. A slight modification of the usual orthogonal bandreduction algorithm allows them to reveal this structure, which then leads to parallelism in the form of independent diagonal blocks. Compared to the usual Householder reduction algorithm, the approach allows significantly more scope for the exploitation of parallelism and can reduce the number of floating-point operations by up to 50%. The actual savings depend very much on the number of distinct eigenvalues, but at worst it behaves exactly like the usual tridiagonalization procedure. They also mention how the resulting tridiagonal structure can be employed very advantageously in determining range and nullspaces of symmetric matrices with two distinct eigenvalues, one of which is zero.

2529 (ANL/MCS/PP–76460) **A framework for symmetric band reduction and tridiagonalization.** Bischof, C.H.; Sun, X. Argonne National Lab., IL (United States). Mathematics and Computer Science Div. [1994]. 16p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract W-31109-ENG-38. Contract DM28E04120. Order Number DE95002919. Source: OSTI; NTIS; GPO Dep.

This paper develops a framework for bandwidth reduction and tridiagonalization algorithms for symmetric banded matrices. The algorithm family includes the algorithms by Rutishauser and Schwarz, which underlie the EISPACK and LAPACK implementations, and the algorithm recently proposed by Lang. The framework leads to algorithms that require fewer floating-point operations, allow for space-time tradeoffs, enable the use of block orthogonal transformations, and increase the degree of parallelism inherent in the algorithm.

2530 (ANL/MCS/PP–77544) **FORTRAN M: A language for modular parallel programming.** Foster, I.T. (Argonne National Lab., IL (United States). Mathematics and Computer Science Div.); Chandy, K.M. Argonne National Lab., IL (United States). Mathematics and Computer Science Div. Jun 1992. 30p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract

W-31109-ENG-38. Contract CCR-8809615. Order Number DE95002921. Source: OSTI; NTIS; GPO Dep.

FORTRAN M is a small set of extensions to FORTRAN 77 that supports a modular approach to the design of message-passing programs. It has the following features. (1) Modularity, programs are constructed by using explicitly-declared communication channels to plug together program modules called processes. A process can encapsulate common data, subprocesses, and internal communication. (2) Safety, operations on channels are restricted so as to guarantee deterministic execution, even in dynamic computations that create and delete processes and channels. Channels are typed, so a compiler can check for correct usage. (3) Architecture Independence, the mapping of processes to processors can be specified with respect to a virtual computer with size and shape different from that of the target computer. Mapping is specified by annotations that influence performance but not correctness. (4) Efficiency, FORTRAN M can be compiled efficiently for uniprocessors, shared-memory computers, distributed-memory computers, and networks of workstations. Because message passing is incorporated into the language, a compiler can optimize communication as well as computation.

2531 (AREAEE–313) **A software package to process an INIS magnetic tape on the VAX computer.** Omar, A.A.; Mohamed, F.A. Nuclear Research Centre, Inshas (Egypt). 1991. 19p. Order Number DE95606978. Source: OSTI; NTIS (US Sales Only); INIS.

This paper presents a software package whose function is to process the magnetic tapes distributed by the Atomic Energy Agency, on the VAX computers. These tapes contain abstracts of papers in the different branches of nuclear field and is supplied from the international Nuclear Information system (INIS). Two goals are aimed from this paper. First it gives a procedure to process any foreign magnetic tape on the VAX computers. Second, it solves the problem of reading the INIS tapes on a non IBM computer and thus allowing the specialists to gain from the large amount of information contained in these tapes. 11 fig.

2532 (BNL–60655) **The PROSAIC Laplace and Fourier Transform.** Smith, G.A. Brookhaven National Lab., Upton, NY (United States). [1994]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9410219–3: Beam instrumentation workshop, Vancouver (Canada), 2-6 Oct 1994). Order Number DE95002225. Source: OSTI; NTIS; INIS; GPO Dep.

Integral Transform methods play an extremely important role in many branches of science and engineering. The ease with which many problems may be solved using these techniques is well known. In Electrical Engineering especially, Laplace and Fourier Transforms have been used for a long time as a way to change the solution of differential equations into trivial algebraic manipulations or to provide alternate representations of signals and data. These techniques, while seemingly overshadowed by today's emphasis on digital analysis, still form an invaluable basis in the understanding of systems and circuits. A firm grasp of the practical aspects of these subjects provides valuable conceptual tools. This tutorial paper is a review of Laplace and Fourier Transforms from an applied perspective with an emphasis on engineering applications. The interrelationship of the time and frequency domains will be stressed, in an attempt to comfort those who, after living so much of their lives in the time domain, find thinking in the frequency domain disquieting.

2533 (CONF-950130–1) **Solution of potential flow problems on a network of workstations.** Semeraro, B.D. Oak Ridge National Lab., TN (United States). 14 Jun 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 33. American Institute of Aeronautics and Astronautics (AIAA) aerospace sciences meeting; Reno, NV (United States); 9-12 Jan 1995. Order Number DE94017861. Source: OSTI; NTIS; GPO Dep.

This paper deals with the solution of potential flow problems via a panel or boundary element method on a network of scientific workstations. The idea is to treat the workstation network as a relatively course grained parallel computer and to distribute the work of constructing the influence coefficient matrix over the network. We make use of the Parallel Virtual Machine (PVM) software developed at the Oak Ridge National Laboratory to do the interprocess communications. We specifically address the problem of how to distribute the data across the network as well as the implementation of the parallel linear system solver.

2534 (DOE/ER/25012–5) **Functional & para-functional parallel processing.** Yale Univ., New Haven, CT (United States). Dept. of Computer Science. [1994]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER25012. Order Number DE95002805. Source: OSTI; NTIS; GPO Dep.

For years (about 20, in fact) dataflow researchers have argued for the use of dataflow (a subset of functional) languages for parallel computing, resting their proof on the ability to construct large-scale dataflow machines to realize the inherent parallelism in Functional programs. Unfortunately, such machines have never materialized as commercial products - instead, the market shows a vast variety of parallel multiprocessors that require special skills to program. It may be the case that these machines reflect a wrong direction in computer architecture design, and it may be the case that dataflow machines are the right way to go, but the proof is in the pudding, and thus far there does not exist even a prototype dataflow machine that can prove the 'dataflow thesis.' Under the circumstances it would seem rather foolhardy simply to ignore the commercial parallel machines that are available now, regardless of one's favorite programming methodology or concurrency model. It has been the authors' thesis that one can in fact use such machines effectively, while maintaining the concomitant thesis that functional programming is good for parallel computation. During the last two years the author has made considerable progress to support this two-fold thesis, and is now prepared to extend this work in several ways. The authors' particular interest, and presumably the primary interest to DOE, is to concentrate the work in the area of scientific computing, including functional language features, program development tools, and systems support tailored for scientific computing applications. The authors' desire to do this reflects confidence that this approach really will work for scientific computing - the author has spent two years proving the viability of the ideas, and now it's time to put them into action.

2535 (DOE/ER/25012–6) **Research in functional programming on multiprocessor architectures: Final report.** Hudak, P. Yale Univ., New Haven, CT (United States). Dept. of Computer Science. Apr 1993. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-86ER25012. Order Number DE95002808. Source: OSTI; NTIS; GPO Dep.

The importance of parallel computing hardly needs emphasis. It is clear that many physical problems and abstract models are seriously compute-bound, since sequential computer technology is now facing fundamental physical limitations that appear insurmountable. It is widely believed that the only feasible path toward higher performance is to consider radically different computer organizations, in particular ones exploiting parallelism. This argument has been made repetitively for many years now, and considerable progress has been made in the construction of highly-parallel machines. For example, one of the simplest and most promising types of parallel machines is the well-known multiprocessor architecture which can be characterized as a large collection of simple, autonomous processors with either shared or distributed memory, and usually "communicating by messages." Although designing and building such machines has proceeded at a dramatic pace, the development of effective ways to program them generally has not. This is an unfortunate state of affairs, since experience on sequential machines tells one that software development is the most critical element is a system's design, not the hardware. The immense complexity of parallel computation can only increase this dependence on software - clearly one needs effective ways to program these parallel machines. This research project was concerned with precisely this problem, and in this final report the author summarizes advances made in language design models for parallel computing, and semantic program analysis. His overall methodology - para-functional programming - is based on a functional programming model augmented with tools to allow the programmer to map programs to specific multiprocessors.

2536 (DOE/ER/25149–T1) **HPCC technology awareness program: Improved economic competitiveness through technology awareness, transfer and application: Final report.** IG Technologies, San Diego, CA (United States). Apr 1994. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG03-93ER25149. Order Number DE95002134. Source: OSTI; NTIS; GPO Dep.

A need has been defined by Congress for the DOE National Laboratories to participate in various dual use and technology transfer programs. This requirement has spawned several technology transfer approaches at the DOE laboratories. These programs are designed to encourage large and small business to bring their problems and needs forward, and to allow the labs to transfer effective high performance computing technology to the commercial marketplace. This IG Technologies grant from the DOE was undertaken to address the issues and problems associated with technology transfer between the DOE National Laboratories and commercial industry. The key focus is to gain an understanding of how DOE and industry independently and collectively view the requirements and the missing elements that could allow DOE to facilitate HPCC technology transfer. At issue is HPCC Technology Transfer for the High Performance Computing industry and its relationship to the DOE National Laboratories. Several observations on this are addressed. The issue of a "Technology Utilization Gap" between the National Laboratories and Independent Software Vendors is discussed. This study addressed the HPCC Technology Transfer plans of all six DOE National Labs. Study team members briefed numerous industrial users of HPCC technology as to the feasibility of technology transfer for various applications. Significant findings of the effort are that the resistance to technology transfer is much higher than anticipated for both the National Labs and industry. Also, HPCC Technology Transfer is observed to be a large company's dominion. Small businesses have a difficult time in addressing the requirements of technology transfer using Cooperative Research and Development Agreements (CRADA's). Large businesses and the DOE National Labs however, often have requirements and objectives which are at cross purposes, making effective technology transfer difficult.

2537 (ESTSC–000165IBMPC07) **AES6.0F: Automated Estimating System.** Holder, D.A. (K-25 Site, Martin Marietta Energy Systems, Oak Ridge, TN (United States)). Oak Ridge K-25 Site, TN (United States). 1 Jun 1994. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Source: ESTSC.

Description: IBM PC; DOS 3.1 or higher; Borland's Turbo Pascal 7.0; 7 3.5 Diskettes. At the time the computer is booted, a file named CONFIG.SYS must be in the root directory of the drive from which the system is loaded. The file must contain at least the following lines: FILES = ff, BUFFERS = bb, where ff must be at least 13 and bb must be at least 10. AES6.0F incorporates some codes which accompanies the Turbo Toolbox software package. It is permissible to distribute the object code of these routines with a production system. The source code cannot be distributed due to license restrictions from Borland International, Inc. If errors are encountered during compilation, turn off the strict variable checking in passing parameters. SOURCE CODE IS NOT INCLUDED WITH PACKAGE.

AES6.0F enters and updates the detailed cost, schedule, contingency, and escalation information contained in a typical construction or other project cost estimate. It combines this information to calculate both unescalated and escalated and cash flow values for the project. These costs can be reported at varying levels of detail. AES6.0F differs from previous versions in at least the following ways: The schedule is entered at the WBS-Prticipant, Activity Level - multiple activities can be assigned to each WBS-Participant combination; the spending curve is defined at the schedule activity level and a weighing factor is defined which determines percentage of cost for the WBS-Participant applied to the schedule activity; Schedule by days instead of Fiscal Year/Quarter; Sales Tax is applied at the Line Item Level- a sales tax codes is selected to indicate Material, Large Single Item, or Professional Services; a 'data filter' has been added to allow user to define data the report is to be generated for; Overhead was moved from the body of each report to the bottom of the report; Block printing was added to the WBS, Schedule, and the B/M List screen; A directory tree was added to the 'Combine' utility; Overhead and Indirect %'s are displayed on the Additive Screen; Reporting at multiple WBS levels is available; The Cost Guidance Report help file has been updated; optional reporting of Overhead in Fiscal Year Report (reported on bottom line or in body of report); and a New Manhours Report.

2538 (ESTSC–000188IBMPC00) **CHEMKIN2: General Gas-Phase Chemical Kinetics.** Rupley, F.M. (Sandia National Labs., Livermore, CA (United States)). Sandia Labs., Livermore, CA (United States). 24 Jan 1992. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. Source: ESTSC.

Description: IBM PC; DOS; FORTRAN; 1 3.5 Diskette. The single and double precision polynomial fitting subroutines and associated error handling subroutines are from the Version 8.1 Sandia Mathematical Program Library.

CHEMKIN is a high-level tool for chemists to use to describe arbitrary gas-phase chemical reaction mechanisms and systems of governing equations. It remains, however, for the user to select and implement a solution method; this is not provided. It consists of two major components: the Interpreter and the Gas-phase Subroutine Library. The Interpreter reads a symbolic description of an arbitrary, user-specified chemical reaction mechanism. A data file is generated which forms a link to the Gas-phase Subroutine Library, a collection of about 200 modular subroutines which may be called to return thermodynamic properties, chemical production rates, derivatives of thermodynamic properties, derivatives of chemical production rates, or sensitivity parameters. Both single and double precision versions of CHEMKIN are included. Also provided is a set of FORTRAN subroutines for evaluating gas-phase transport properties such as thermal conductivities, viscosities, and diffusion coefficients. These properties are an important part of any computational simulation of a chemically reacting flow. The transport properties subroutines are designed to be used in conjunction with the CHEMKIN Subroutine Library. The transport properties depend on the state of the gas and on certain molecular parameters. The parameters considered are the Lennard-Jones potential well depth and collision diameter, the dipole moment, the polarizability, and the rotational relaxation collision number.

2539 (FRNC-TH–3738) **Design and implementation of an integrated architecture for massive parallel data treatment of analogue signals supplied by silicon detectors of very high spatial resolution.** Michel, J. Strasbourg-1 Univ., 67 (France). Feb 1993. 165p. (In French). Order Number DE95606979. Source: OSTI; NTIS (US Sales Only); INIS.

This doctorate thesis studies an integrated architecture designed to a parallel massive treatment of analogue signals supplied by silicon detectors of very high spatial resolution. The first chapter is an introduction presenting the general outline and the triggering conditions of the spectrometer. Chapter two describes the operational structure of a microvertex detector made of Si micro-plates associated to the measuring chains. Information preconditioning is related to the pre-amplification stage, to the pile-up effects and to the reduction in the time characteristic due to the high counting rates. The chapter three describes the architecture of the analogue delay buffer, makes an analysis of the intrinsic noise and presents the operational testings and input/output control operations. The fourth chapter is devoted to the description of the analogue pulse shape processor and gives also the testings and the corresponding measurements on the circuit. Finally, the chapter five deals with the simplest modeling of the entire conditioning chain. Also, the testings and measuring procedures are here discussed. In conclusion the author presents some prospects for improving the signal-to-noise ratio by summation of the de-convoluted micro-paths. 78 refs., 78 figs., 1 annexe.

2540 (INIS-mf–14340, pp. 195-204) **Enhancement of peak searching capability in nuclear spectrometry.** Wanabongse, P. Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings.* Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

THE PAPER AND INK USED IN THE ORIGINAL PUBLICATION MAY AFFECT THE QUALITY OF THE MICROFORM EDITION

This report on continuous development of computerized analysis in nuclear spectroscopy is the comparison on photopeak searching capability for gamma-ray spectrum data obtained with solid state detectors. Two well-known analysis programs, SAMPO and SPECFIT, were employed (with the consent of the authors of the programs). When these two algorithms in photopeak searching are combined it is resulted in a corrective action to the weakness points when each program is executed separately.

2541 (INIS-mf–14340, pp. 250-265) **Software program for a study and calculation of radiation.** Srisatit, S. (Chulalongkorn Univ., Bangkok (Thailand). Dept. of Nuclear Technology). Office of Atomic Energy for Peace, Bangkok (Thailand). [1990]. 481p. (In Thai). (CONF-9004375–: 3. Nuclear Science and Technology Conference, Bangkok (Thailand), 23-25 Apr 1990). In *Nuclear Science and Technology Conference 1990. Proceedings*. Order Number DE95605567. Source: OSTI; NTIS (US Sales Only); INIS.

Nowadays radiation and radioactive materials are used extensively in medicine, in industry, and in agriculture. In medicine, they are used in radiation therapy and diagnosis. In industry, they can be used for non-destructive testing of materials, gauging as well as sterilization of medical products. Furthermore, they are also used in agriculture such as food preservation and pest control. In utilizing radiation and radioactive materials, radiation safety control is of great importance. This paper describes a software package developed for calculation of radiation dose after injection of Hg-197m, Hg-197 or Hg-203 into body. Calculation of wall thickness for X-ray therapeutic and diagnostic rooms are also described.

2542 (IPNO-TH–94-07) **Partitioning of unstructured meshes for load balancing.** Martin, O.C. (Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire); Otto, S.W. Paris-11 Univ., 91 - Orsay (France). Inst. de Physique Nucleaire. Jan 1994. 12p. Order Number DE95606980. Source: OSTI; NTIS (US Sales Only); INIS.

Submitted to Practice and Experience.

Many large-scale engineering and scientific calculations involve repeated updating of variables on an unstructured mesh. To do these types of computations on distributed memory parallel computers, it is necessary to partition the mesh among the processors so that the load balance is maximized and inter-processor communication time is minimized. This can be approximated by the problem, of partitioning a graph so as to obtain a minimum cut, a well-studied combinatorial optimization problem. Graph partitioning algorithms are discussed that give good but not necessarily optimum solutions. These algorithms include local search methods recursive spectral bisection, and more general purpose methods such as simulated annealing. It is shown that a general procedure enables to combine simulated annealing with Kernighan-Lin. The resulting algorithm is both very fast and extremely effective. (authors) 23 refs., 3 figs., 1 tab.

2543 (JINR-E–11-94-140) **On the numerical method for analysis of the dynamics of the classical Hamiltonian systems.** Akishin, P.G.; Puzynin, I.V.; Starkov, V.V.; Vinitskij, S.I. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 12p. Order Number DE95605218. Source: OSTI; NTIS (US Sales Only); INIS.

The numerical algorithm of analysis of the dynamics of the classical Hamiltonian systems with pair potentials is proposed. The method uses the Taylor expansions of solution. The main supposition is: the terms of this Taylor's series may be expressed analytically. There are such potentials which are important in physics. The proposed algorithm allows one to choose efficiently the integration step depending on the behavior of the truncation error of the series, and also to carry out the parallel analysis of evaluation of the small perturbation of solution, which, in turn, makes it possible to reason about such properties of the system as the stability and the transition to chaotic regime. The codes realizing the proposed method have been created. The results of the numerical calculations for some Hamiltonian systems are given. 9 refs.; 15 tabs. (author).

2544 (JINR-E–11-94-204) **The use of DBMS and document oriented interface in the TPLAN-system.** Fernandez, F.N. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 10p. Order Number DE95605219. Source: OSTI; NTIS (US Sales Only); INIS.

The paper describes the user-friendly input/output interface (DOI) for the TPLAN database management system that includes high quality output in Latex format from databases and retrieves selected information from Latex document (according to a specific grammar that includes a subset of the Latex grammar) to be stored in the databases. The TPLAN system was developed to manage the annual Topical Plan of JINR. It was written in 'C' and DOS Fox Base/Fox Pro for IBM comparable personal computer. It was also proto typed in Visual Basic and Windows Access using standard V B controls. 8 refs.; 7 figs. (author).

2545 (JINR-R–10-94-105) **Dynamics of nonadiabatic charged particles in the magnetic dipole field with imposed homogeneous magnetic field.** Amirkhanov, I.V. (Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation); Zhidkov, E.P.; Dzyuba, Yu.G.; Il'ina, A.N.; Il'in, V.D.; Il'in, I.V. Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation. 1994. 34p. (In Russian). Order Number DE95605222. Source: OSTI; NTIS (US Sales Only); INIS.

The model of charged particles motion in the summary dipole and external uniform, parallel to dipole, field is considered. External field associates with the effect of magnetic perturbation. Such problem appears, for example, for protons in geomagnetic field during the magnetic storm. In contrast to traditional model, not the line of force, but the so-called Central Trajectory (CT-trajectory which passes through the dipole centre) is used as the leading centre's trajectory. It allows to save the basic ideas of adiabatic theory for the nonadiabatic case in modified form. CT was constructed with the help of numerical experiments and its characteristics are described. 57 refs.; 8 figs. (author).

2546 (LA–12855-MS) **A survey of artificial neural network applications in flow analysis of energy networks.** Madhok, V. Los Alamos National Lab., NM (United States). Nov 1994. 34p. Sponsored by Department of Transportation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002452. Source: OSTI; NTIS; GPO Dep.

This report presents the results of a literature survey carried out to analyze the work done so far using artificial neural networks (ANNs) in tasks of flow assessment in networked systems. The survey revealed that current implementations developed so far may be classified as pattern analysis and optimization, with a parallel grouping for the types of ANNs used: the feedforward network trained using error backpropagation and the Hopfield network. Pattern analysis has been used in developing ANNs for prediction and system security monitoring, with the Kohonen feature map, as well as the backpropagation type of network, being useful in the latter application. Results have been promising, showing ANNs' potential for use in problems of load flow analysis in dense energy networks or in system monitoring in hazardous situations. Problems of the nature of resource scheduling, optimal path search, and so forth, have been handled in general by methods based on Hopfield dynamics. By and large, however, large-scale commercial applications of ANNs are rare. Industry has failed to exploit the technology fully, probably because of a lack of funding and the necessary multifaceted scientific workforce.

2547 (LA–12856-MS) **Utilizing artificial neural networks in netwsork flow analysis: An annotated bibliography.** Madhok, V. Los Alamos National Lab., NM (United States). Nov 1994. 14p. Sponsored by Department of Transportation, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95002453. Source: OSTI; NTIS; GPO Dep.

This annotated bibliography reviews research in the development of neural network applications for power systems and for traffic and communications networks. Papers describing neural network techniques for applications such as security assessment, load forecasting, scheduling, and maintenance planning are cited. Some articles that present new algorithms for optimization or pattern analysis with the potential for neural network implementations also have been included.

2548 (LAL-RT–94-01) **VAXNEWS version 3.12: User manual.** Callot, O. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Feb 1994. [73p.] Order Number DE95606981. Source: OSTI; NTIS (US Sales Only); INIS.

VAXNEWS can be used as a local news system or bulletin board. However, VAXNEWS is basically a networked news system, allowing any member of a large collaboration to read information, and also to write information which is distributed to all the computers where this information should go. This document describes the VAXNEWS utility. The concepts used in VAXNEWS, the usage and the syntax of the user commands are documented. This document is intended for the normal user of VAXNEWS. The document is divided into two parts: a section describing VAXNEWS and how to use it, and a section describing each user commands in detail. (K.A.).

2549 (LAL-RT–94-02) **VAXNEWS version 3.12: Management manual.** Callot, O. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Feb 1994. [109p.] Order Number DE95606982. Source: OSTI; NTIS (US Sales Only); INIS.

VAXNEWS can be used as a local news system or bulletin board. However, VAXNEWS is basically a networked news system, allowing any member of a large collaboration to read information, and also to write information which is distributed to all the computers where this information should go. VAXNEWS utility is described for the manager point of view. The installation procedure, the overview of the system, the files structure, the network setup and operation, remote management and management commands are presented. (author).

2550 (LAL-RT–94-03) **EDFOR version 5.6: User guide and reference manual.** Callot, O. Paris-11 Univ., 91 - Orsay (France). Lab. de l'Accelerateur Lineaire. Feb 1994. [68p.] Order Number DE95606983. Source: OSTI; NTIS (US Sales Only); INIS.

The document describes EDFOR, a full screen text editor running on VMS systems. The document is intended to be easy to read for new users. It also contains all the information needed by an advanced user to take full advantage of the power of EDFOR, and to customize it. The first two chapters of the document are intended for a new or occasional user of EDFOR. They should help to use the basic features. More advanced users can benefit from the third chapter. Installation, modifications and tailoring to the user needs are described in the last chapter. (K.A.).

2551 (ORNL/TM–12753) **QMRPACK and applications.** Freund, R.W. (AT&T Bell Labs., Murray Hill, NJ (United States)); Nachtigal, N.M. Oak Ridge National Lab., TN (United States). Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001651. Source: OSTI; NTIS; GPO Dep.

QMRPACK is a package of quasi-minimal residual algorithms for the iterative solution of linear systems. In this paper, the authors describe the main features of QMRPACK, comment on the implementations found in the package, and discuss how they would be invoked in a user code. They briefly describe two applications of the codes in the area of simulation of material properties from first principles, and in circuit simulation. They conclude by presenting future directions for QMRPACK.

2552 (ORNL/TM–12754) **A new Krylov-subspace method for symmetric indefinite linear systems.** Freund, R.W. (AT and T Bell Labs., Murray Hill, NJ (United States)); Nachtigal, N.M. Oak Ridge National Lab., TN (United States). Oct 1994. 16p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001826. Source: OSTI; NTIS; GPO Dep.

Many important applications involve the solution of large linear systems with symmetric, but indefinite coefficient matrices. For example, such systems arise in incompressible flow computations and as subproblems in optimization algorithms for linear and nonlinear programs. Existing Krylov-subspace iterations for symmetric indefinite systems, such as SYMMLQ and MINRES, require the use of symmetric positive definite preconditioners, which is a rather unnatural restriction when the matrix itself is highly indefinite with both many positive and many negative eigenvalues. In this note, the authors describe a new Krylov-subspace iteration for solving symmetric indefinite linear systems that can be combined with arbitrary symmetric preconditioners. The algorithm can be interpreted as a special case of the quasi-minimal residual method for general non-Hermitian linear systems, and like the latter, it produces iterates defined by a quasi-minimal residual property. The proposed method has the same work and storage requirements per iteration as SYMMLQ or MINRES, however, it usually converges in considerably fewer iterations. Results of numerical experiments are reported.

2553 (ORNL/TM–12807) **QMRPACK user's guide.** Freund, R.W. (AT&T Bell Labs., Murray Hill, NJ (United States)); Nachtigal, N.M.; Reeb, J.C. Oak Ridge National Lab., TN (United States). Oct 1994. 25p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001770. Source: OSTI; NTIS; GPO Dep.

QMRPACK is a library of FORTRAN 77 subroutines that may be used to solve linear systems of equations with the quasi-minimal residual (QMR) method and to compute eigenvalue approximations. This User's Guide is designed to be an overview of the codes contained in QMRPACK. Installation information is provided, and the example matrix format is discussed. The relative merits of each algorithm, as well as usage criterion are described. The authors also provide instructions for making the test drivers, as well as test output from several machines.

2554 (ORNL/TM–12819) **Learning algorithms for feedforward networks based on finite samples.** Rao, N.S.V.; Protopopescu, V.; Mann, R.C.; Oblow, E.M.; Iyengar, S.S. Oak Ridge National Lab., TN (United States). Sep 1994. 37p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001739. Source: OSTI; NTIS; GPO Dep.

Two classes of convergent algorithms for learning continuous functions (and also regression functions) that are represented by feedforward networks, are discussed. The first class of algorithms, applicable to networks with unknown weights located only in the output layer, is obtained by utilizing the potential function methods of Aizerman et al. The second class, applicable to general feedforward networks, is obtained by utilizing the classical Robbins-Monro style stochastic approximation methods. Conditions relating the sample sizes to the error bounds are derived for both classes of algorithms using martingale-type inequalities. For concreteness, the discussion is presented in terms of neural networks, but the results are applicable to general feedforward networks, in particular to wavelet networks. The algorithms can be directly adapted to concept learning problems.

2555 **Method and apparatus for high speed data acquisition and processing.** Ferron, J.R. To Dept. of Energy. 1992. Filed date 25 Sep 1992. U.S. Patent Application 7-950,548. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-89ER51114. Order Number DE95001779. Source: OSTI; NTIS (US Sales Only); GPO Dep.

This report discusses a method and apparatus for high speed digital data acquisition. The apparatus includes one or more multiplexers for receiving multiple channels of digital data at a low data rate and asserting a multiplexed data stream at a high data rate, and one or more FIFO memories for receiving data from the multiplexers and asserting the data to a real time processor. Preferably, the invention includes two multiplexers, two FIFO memories, and a 64-bit bus connecting the FIFO memories with the processor. Each multiplexer receives four channels of 14-bit digital data at a rate of up to 5 MHz per channel, and outputs a data stream to one of the FIFO memories at a rate of 20 MHz. The FIFO memories assert output data in parallel to the 64-bit bus, thus transferring 14-bit data values to the processor at a combined rate of 40 MHz. The real time processor is preferably a floating-point processor which processes 32-bit floating-point words. A set of mask bits is prestored in each 32-bit storage location of the processor memory into which a 14-bit data value is to be written. After data transfer from the FIFO memories, mask bits are concatenated with each stored

14-bit data value to define a valid 32-bit floating-point word. Preferably, a user can select any of several modes for starting and stopping direct memory transfers of data from the FIFO memories to memory within the real time processor, by setting the content of a control and status register.

2556 (SAND–94-1826) **A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores.** Dunn, W.N. (Sandia National Labs., Albuquerque, NM (United States). Experimental Structural Dynamics Dept.). Sandia National Labs., Albuquerque, NM (United States). Jul 1994. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95001919. Source: OSTI; NTIS; GPO Dep.

LUGSAN (LUG and Sway brace ANalysis) is a analysis and database computer program designed to calculate store lug and sway brace loads from aircraft captive carriage. LUGSAN combines the rigid body dynamics code, SWAY85 and the maneuver calculation code, MILGEN, with an INGRES database to function both as an analysis and archival system. This report describes the operation of the LUGSAN application program, including function description, layout examples, and sample sessions. This report is intended to be a user's manual for version 1.1 of LUGSAN operating on the VAX/VMS system. The report is not intended to be a programmer or developer's manual.

2557 (SAND–94-2349C) **Technologies for highly parallel optoelectronic integrated circuits.** Lear, K.L. (Sandia National Labs., Albuquerque, NM (United States). Photonics Research Dept.). Sandia National Labs., Albuquerque, NM (United States). [1994]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9410195–2: GaAs symposium, Philadelphia, PA (United States), 16-19 Oct 1994). Order Number DE95001607. Source: OSTI; NTIS; GPO Dep.

While summarily reviewing the range of optoelectronic integrated circuits (OEICs), this paper emphasizes technology for highly parallel optical interconnections. Market volume and integration suitability considerations highlight board-to-board interconnects within systems as an initial insertion point for large OEIC production. The large channel count of these intrasystem interconnects necessitates two-dimensional laser transmitter and photoreceiver arrays. Surface normal optoelectronic components are promoted as a basis for OEICs in this application. An example system is discussed that uses vertical cavity surface emitting lasers for optical buses between layers of stacked multichip modules. Another potentially important application for highly parallel OEICs is optical routing or packet switching, and examples of such systems based on smart pixels are presented.

2558 (SAND–94-2548C) **Top ten list of user-hostile interface design.** Miller, D.P. Sandia National Labs., Albuquerque, NM (United States). [1994]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-941001–2: 41. annual American Vacuum Society symposium, Denver, CO (United States), 24-28 Oct 1994). Order Number DE95001602. Source: OSTI; NTIS; GPO Dep.

This report describes ten of the most frequent ergonomic problems found in human-computer interfaces (HCIs) associated with complex industrial machines. In contrast with being thought of as "user friendly," many of these machines are seen as exhibiting "user-hostile" attributes by the author. The historical lack of consistent application of ergonomic principles in the HCIs has led to a breed of very sophisticated, complex manufacturing equipment that few people can operate without extensive orientation, training, or experience. This design oversight has produced the need for extensive training programs and help documentation, unnecessary machine downtime, and reduced productivity resulting from operator stress and confusion. Ergonomic considerations affect industrial machines in at least three important areas: (1) the physical package including CRT and keyboard, maintenance access areas, and dedicated hardware selection, layout, and labeling; (2) the software by which the user interacts with the computer that controls the equipment; and (3) the supporting documentation.

2559 (SAND–94-8718C) **An object-oriented implementation of the Xpress Transfer Protocol.** Strayer, W.T.; Gray, S.; Cline, R.E. Jr. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00789. (CONF-9409236–1: 2. IWACA workshop, Heidlegerg (Germany), 26-28 Sep 1994). Order Number DE95001506. Source: OSTI; NTIS; GPO Dep.

Object-oriented design principles map well onto protocol implementations because protocols essentially manipulate two structures - packets and the states of the endpoints. In this paper the authors describe an implementation of the Xpress Transfer Protocol as a user space daemon written in C++. The object-oriented model forces the programmer to properly place functionality and information ownership. The model facilitates porting to various platforms and greatly eases the task of building data delivery services.

2560 (UCRL-JC–115854) **The National Storage Laboratory: Overview and status.** Watson, R.W.; Coyne, R. Lawrence Livermore National Lab., CA (United States). 19 Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9406150–1: 13. IEEE symposium and international symposium on mass storage systems: towards distributed storage and data management systems, Annecy (France), 12-16 Jun 1994). Order Number DE95001837. Source: OSTI; NTIS; GPO Dep.

The National Storage Laboratory (NSL) was organized to investigate, demonstrate, and commercialize high-performance hardware and software storage technologies that promise to remove network computing bottlenecks and provide critically needed new storage systems functionality. This paper briefly outlines the goals, collaboration and current status of the NSL.

2561 (UCRL-JC–116231-Rev.1) **Visualizing 3D velocity fields near contour surfaces: Revision 1.** Max, N.; Crawfis, R.; Grant, C. Lawrence Livermore National Lab., CA (United States). 8 Aug 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941085–1-Rev.1: Visualization '94, Washington, DC (United States), 17-21 Oct 1994). Order Number DE95000841. Source: OSTI; NTIS; GPO Dep.

Vector field rendering is difficult in 3D because the vector icons overlap and hide each other. We propose four different techniques for visualizing vector fields only near surfaces. The first uses motion blurred particles in a thickened region around the surface. The second uses a voxel grid to contain integral curves of the vector field. The third uses many antialiased lines through the surface, and the fourth uses hairs sprouting from the surface and then bending in the direction of the vector field. All the methods use the graphics pipeline, allowing real time rotation and interaction, and the first two methods can animate the texture to move in the flow determined by the velocity field.

2562 (UCRL-JC–116963) **An image cancellation approach to depth-from-focus.** Lu, Shin-yee (Lawrence Livermore National Lab., CA (United States)); Graser, M. Lawrence Livermore National Lab., CA (United States). 12 Sep 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410154–1: SPIE international symposium on photonic sensors and controls for commercial applications, Boston, MA (United States), 31 Oct - 4 nov 1994). Order Number DE94019312. Source: OSTI; NTIS; GPO Dep.

Depth calculation of a object allows computer reconstruction of the surface of the object in three dimensions. Such information provides human operators 3D measurements for visualization, diagnostic and manipulation. It can also provide the necessary coordinates for semi or furry automated operations.This paper describes a microscopic imaging system with computer vision algorithms that can obtain the depth information by making use of the shallow depth of field of microscopic lenses.

2563 (UCRL-JC–117547) **Quantitative evaluation of wrist posture and typing performance: A comparative study of 4 computer keyboards.** Burastero, S. Lawrence Livermore National Lab., CA (United States). May 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-941086–3: 38. annual meeting of the Human Factors and Ergonomics Society, Nashville, TN (United States), 24-28 Oct

1994). Order Number DE95002392. Source: OSTI; NTIS; GPO Dep.

The present study focuses on an ergonomic evaluation of 4 computer keyboards, based on subjective analyses of operator comfort and on a quantitative analysis of typing performance and wrist posture during typing. The objectives of this study are (1) to quantify differences in the wrist posture and in typing performance when the four different keyboards are used, and (2) to analyze the subjective preferences of the subjects for alternative keyboards compared to the standard flat keyboard with respect to the quantitative measurements.

2564 (UCRL-JC–117548) **Ergonomic evaluation of the Apple Adjustable Keyboard.** Tittiranonda, P. (Lawrence Livermore National Lab., CA (United States)); Burastero, S.; Shih, M.; Rempel, D. Lawrence Livermore National Lab., CA (United States). May 1994. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-940876–2: International Ergonomics Association workshop, Toronto (Canada), 15-19 Aug 1994). Order Number DE95002393. Source: OSTI; NTIS; GPO Dep.

This study presents an evaluation of the Apple Adjustable Keyboard based on subjective preference and observed joint angles during typing. Thirty five keyboard users were asked to use the Apple adjustable keyboard for 7–14 days and rate the various characteristics of the keyboard. Our findings suggest that the most preferred opening angles range from 11–20°. The mean ulnar deviation on the Apple Adjustable keyboard is 11°, compared to 16° on the standard keyboard. The mean extension was decreased from 24° to 16° when using the adjustable keyboard. When asked to subjectively rate the adjustable keyboard in comparison to the standard, the average subject felt that the Apple Adjustable Keyboard was more comfortable and easier to use than the standard flat keyboard.

2565 (UCRL-JC–118154) **High speed optical links between LLNL and Berkeley.** Lennon, W.J.; Thombley, R.L. Lawrence Livermore National Lab., CA (United States). 8 Aug 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-9410154–2: SPIE international symposium on photonic sensors and controls for commercial applications, Boston, MA (United States), 31 Oct - 4 nov 1994). Order Number DE95000552. Source: OSTI; NTIS; INIS; GPO Dep.

The Advanced Telecommunications Program at Lawrence Livermore National Laboratory, in collaboration with Pacific Bell, is developing an experimental high speed, four wavelength, protocol independent optical link for evaluating wide area networking interconnection schemes and the use of fiber amplifiers. Lawrence Livermore National Laboratory, as a super-user, supercomputer, and super-application site, is anticipating the future bandwidth and protocol requirements to connect to other such sites as well as to connect to remote sited control centers and experiments. In this paper we discuss our vision of the future of Wide Area Networking and describe the plans for the wavelength division multiplexed link between Livermore and the University of California at Berkeley.

2566 (WHC-SD-SNF-ATP–001) **Cleanup MAC and MBA code ATP.** Russell, V.K. Westinghouse Hanford Co., Richland, WA (United States). 17 Oct 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95002149. Source: OSTI; NTIS; GPO Dep.

The K Basins Materials Accounting (MAC) and Material Balance (MBA) database system had some minor code cleanup performed to its code. This ATP describes how the code was to be tested to verify its correctness.

9903 Information Handling

Refer also to citation(s) 135, 209, 547, 558, 565, 566, 567, 931, 970, 1027, 1368, 1760, 1915, 2242

2567 (DKRZ-TR–8) **Workshop on climate database systems.** Hoeck, H. (comp.); Lautenschlager, M. (comp.). Deutsches Klimarechenzentrum (DKRZ), Hamburg (Germany). Dec 1993. 103p. (CONF-9308249–: Workshop on climate database systems, Hamburg (Germany), 30 Aug - 2 sep 1993). Order Number DE95707881. Source: OSTI; NTIS (US Sales Only).

A workshop on climate database systems was held from 30.8.93 to 2.9.93 at the DKRZ (Deutsches KlimaRechenZentrum GmbH) in Hamburg. The workshop was intended to provide information of existing database systems and to investigate cooperation in the area of climate database systems. The workshop was split in two parts, the presentation of papers and the discussion in working groups. The report summarizes the presented papers and the recommendations of the working groups. The basic result may be summarized that the system for climate databases does not exist. Additional work has be invested to create an overall climate database in Germany, even in the case that commercial database software is used. The future development should be concentrated on three different areas, i.e. incorporation of sequential storage media, interoperability of different database management systems and the (graphical) user interface. (orig.)

2568 (DOE/ET–0026) **FEDIX: User's guide, Version 5.0/ Release 3.0.** USDOE Office of Science Education and Technical Information, Washington, DC (United States). Sep 1994. 55p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95002274. Source: OSTI; NTIS; GPO Dep.

FEDIX is an on-line information service that links the education community and the federal government to facilitate research, education, and services. The system provides accurate, timely federal agency information to colleges, universities, and other research organizations. Participating agencies include DOE, FAA, NASA, ONR, AFOSR, DOC, HUD, AID, USDA, and DISA/DARIC. This guide is intended to help users access and utilize the FEDIX system. Because the system is frequently updated, some menus and tables in the text may not exactly match those displayed on the live system.

2569 (ES/IMS–1) **Abbreviations, acronyms, and initialisms frequently used by Martin Marietta Energy Systems, Inc.: Second edition.** Miller, J.T. Oak Ridge National Lab., TN (United States). Sep 1994. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95001069. Source: OSTI; NTIS; GPO Dep.

Guidelines are given for using abbreviations, acronyms, and initialisms (AAIs) in documents prepared by US Department of Energy facilities managed by Martin Marietta Energy Systems, Inc., in Oak Ridge, Tennessee. The more than 10,000 AAIs listed represent only a small portion of those found in recent documents prepared by contributing editors of the Information Management Services organization of Oak Ridge National Laboratory, the Oak Ridge K-25 Site, and the Oak Ridge Y-12 Plant. This document expands on AAIs listed in the Document Preparation Guide and is intended as a companion document

2570 (ETDE/DE-mf–95716345) **Development of a relational database for rated values of metallic materials: Final report.** Kowalski, P.; Hartung, T.; Kirchheiner, R. Krupp-VDM AG, Werdohl (Germany). Mar 1993. 27p. (In German). Sponsored by Bundesministerium fuer Forschung und Technologie, Bonn (Germany). Foerderkennzeichen BMFT 11Z100C. Order Number DE95716345. Source: OSTI; NTIS (US Sales Only).

The "Rated Value Material Database (SWDB)" was prepared within the RandD project "Corrosion Information System (CORIS)" to manage the contents of standards, specifications and general information referring to metallic materials which are of relevance for an engineer's practical work. The main function of this material database is to make information on the materials whose systems are included in CORIS available. Furthermore, the SWDB can also be used separately to find information on chemical compositions, mechanical-technological data, physical properties as well as general information on application and processing. A mass data transformer, which was developed in addition, integrates the rated data of a neutral material control board (RW-TUeV, Essen) and therefore guarantees the error-free application of SWDB on the basis of verified data. A relational database system comprising the corresponding programming tools as well as a graphical user interface, was used for reasons for compatibility and in order to simplify the conversational programming. All development stages - i.e. from

the first design to the implementation - materialized in close cooperation with the partners within the project and the instructed subcontractor and institutions. (orig.)

2571 (IAEA-NDS–7(rev.94/3)) **Index of nuclear data libraries available from the IAEA Nuclear Data Section.** IAEA-NDS-Documentation Series, IAEA-NDS-Documentation Series. Lemmel, H.D. International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section. Mar 1994. 39p. Order Number DE95605213. Source: OSTI; NTIS (US Sales Only); INIS.

This document lists more than 100 nuclear data libraries together with references that give more detailed information about these libraries. The data libraries include neutron cross-sections, resonance parameters, fission-product yields, nuclear structure and decay data, gamma-rays from radionuclides, data of nuclear reactions induced by charged particles or heavy ions, photonuclear data, photoatomic interaction data, and many others, partly with related data processing computer codes. All data and documentation references are available upon request from the IAEA Nuclear Data Section, free of charge on magnetic tape, PC diskettes, or online through the INTERNET computer network: either menu driven within the Nuclear Data Information System (NDIS), or through FTP file transfer. (author).

2572 (INIS-BR–3432) **Technical-scientific production of IPEN - 1992.** Instituto de Pesquisas Energeticas e Nucleares (IPEN), Sao Paulo, SP (Brazil). 1993. 109p. (In Portuguese). Order Number DE95605214. Source: OSTI; NTIS (US Sales Only); INIS.

The technical-scientific production from Nuclear and Energetic Research Institute (IPEN), Brazil, is presented, including 471 references, where 421 papers are from the 1992 year and 50 from the earlier years. The main areas that the IPEN acts are: technical-scientific development of materials; nuclear processes; research reactors; nuclear utilization; nuclear safety and human resources formation. (C.G.C.).

2573 (INIS-mf–14313, pp. 127-144) **Development of nuclear education.** Nagy, M.E. Arab Atomic Energy Agency (AAEA), Tunis (Tunisia); Atomic Energy Establishment, Cairo (Egypt). 1993. 766p. (CONF-9309380–: A seminar on physics and technology of nuclear reactors, Cairo (Egypt), 11 Sep 1993). In *Proceedings of the symposium on the physics and technology of reactors.* Order Number DE95603392. Source: OSTI; NTIS (US Sales Only); INIS.

One noticeable phenomenon regarding the engineering education in general is its tight relation to the industrial, and technological activities in each society. All branches of liberal arts, science, law, medicine, and economy, education seem to have established its roots in the society and grow almost equally with the development. On the other hand, branches of engineering education grow or decline according to the needs of constructions or industrial activities of the society at a given period of time. 6 fig.

9904 Law

2574 (IAEA-INFCIRC–449) **Convention on nuclear safety.** International Atomic Energy Agency, Vienna (Austria). 5 Jul 1994. 85p. (In Arabic, Chinese, English, French, Russian, Order Number DE95604197. Source: OSTI; NTIS (US Sales Only); INIS.

The Convention on Nuclear Safety was adopted on 17 June 1994 by Diplomatic Conference convened by the International Atomic Energy Agency at its Headquarters from 14 to 17 June 1994. The Convention will enter into force on the ninetieth day after the date of deposit with the Depository (the Agency's Director General) of the twenty-second instrument of ratification, acceptance or approval, including the instruments of seventeen States, having each at leas one nuclear installation which has achieved criticality in a reactor core. The text of the Convention as adopted is reproduced in the Annex hereto for the information of all Member States.

2575 (IAEA-INFCIRC–449/add.1) **Convention on nuclear safety. Final act.** International Atomic Energy Agency, Vienna (Austria). 4 Aug 1994. 35p. (In Arabic, Chinese, English, French, Russian, Order Number DE95604198. Source: OSTI; NTIS (US Sales Only); INIS.

The Diplomatic Conference, which was convened by the International Atomic Energy Agency at its Headquarters from 14 to 17 June 1994, adopted the Convention on Nuclear Safety reproduced in document INFCIRC/449 and the Final Act of the Conference. The text of the Final Act of the Conference, including an annexed document entitled "Some clarification with respect to procedural and financial arrangements, national reports, and the conduct of review meetings, envisaged in the Convention on Nuclear Safety", is reproduced in the Attachment hereto for the information of all Member States.

2576 (IAEA/NENP/TC–93/2, pp. 66-79) **[Guidelines for IAEA fellows and trainees].** Alekseenkov, O. (International Atomic Energy Agency, Vienna (Austria). Div. of Technical Cooperation Implementation). International Atomic Energy Agency, Vienna (Austria). 1993. (CONF-9310373–: IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union, Vienna (Austria), 11-15 Oct 1993). In *Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993.* 406p. Order Number DE95604199. Source: OSTI; NTIS (US Sales Only); INIS.

The Fellowships and Training Section is responsible for the timely arrangement of fellowships and scientific visits according to the Agency projects' goals and objectives and according to a country's needs. The main purpose of this presentation is to provide a better understanding of the administrative process for fellowships and scientific visits, to better understand the procedure which the nominating countries have to follow in order to train their personnel.

2577 (INIS-BR–3431) **Guidelines for attendance and registration for radiological emergencies of nuclear accidents.** Comissao Nacional de Energia Nuclear (CNEN), Rio de Janeiro, RJ (Brazil). Diretoria de Radioprotecao e Seguranca Nuclear. [1994]. 83p. (In Portuguese). Order Number DE95604200. Source: OSTI; NTIS (US Sales Only); INIS.

Today in Brazil the use of nuclear energy is becoming an usual practice in various activities. Thus, must be a matter of great weight, directions for attendance and registration for radiological emergencies or nuclear accidents. This work shows the planning elaborated by the Comissao Nacional de Energia Nuclear (Brazilian CNEN) for nuclear plants, aiming avoid the injurious effects from the ionizing radiation exposure, radionuclides release or the direct or indirect exposure of ionizing radiation, that proceeding from a radiological emergencies or a nuclear accidents. (J.A.M.M.).

2578 (INIS-mf–14392, pp. 233-243) **National arrangement to handle nuclear emergencies.** Hubert, P. (CEA Centre d'Etudes de Fontenay-aux-Roses, 92 (France). Inst. de Protection et de Surete Nucleaire). National Atomic Energy Agency, Warsaw (Poland); International Atomic Energy Agency, Vienna (Austria). [1994]. 260p. (CONF-9306383–: Nuclear energy and natural environment, Jadwisin (Poland), 22-23 Jun 1993). In *Nuclear energy and natural environment. Information seminar.* Order Number DE95605953. Source: OSTI; NTIS; INIS.

The national arrangements to handle nuclear emergences has been presented on the example of France. The governmental and local authorities and their tasks in France during implementation of emergency plans has been also described.

Corporate Author Index

This index lists the corporate authors responsible for issuing the documents in this publication which are identified primarily by report number. The corporate names are entered in standardized forms as defined in ETDE/PUB–3 (Rev.1), *International Energy: Research Organizations 1988–1992*. Each entry under a corporate name includes the document title and citation number. Three items of information may appear in parentheses: (1) an abbreviation to identify the document type, such as a report; (2) the country of publication, indicated by International Organization for Standardization (ISO) country code; and (3) the language of the document if non-English (R;CA;In French). Author affiliations are not listed in this index.

A

ABB Atom AB, Vaesteraas (Sweden)
Methods for estimating the content of transuranium and other difficult to measure nuclides in produced rad waste from BWRs, 20:215 (R;SE)

ABB Combustion Engineering, Windsor, CT (United States). Power Plant Labs.
Development and testing of a high efficiency advanced coal combustor: Phase III Industrial boiler retrofit: Quarterly technical progress report number 10, January 1–March 31, 1994, 20:88 (R;US)

ABB Kraftwerke AG, Mannheim (Germany). Abt. Gasturbinenentwicklung
Further development of the seven-hole probe technique for steady flow measurements: Final report, 20:1472 (R;DE;In German)

ABB/Combustion Engineering, Inc., Windsor, CT (United States)
The evaluation and demonstration of methods for improved nuclear fuel utilization: Final report, 20:762 (R;US)

Advanced Fuel Research, Inc., East Hartford, CT (United States)
Fossil fuel conversion–measurement and modeling, 20:729 (R;US)

Advanced Resources International, Inc., Arlington, VA (United States)
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, October 1, 1993–January 30, 1994, 20:132 (R;US)
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, January 1, 1994–March 31, 1994, 20:133 (R;US)

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Energy and the environment: Investigation carried out by the Energy Conservation Committee on the attitudes and behaviour of the public in relation to environmental protection and energy conservation, 20:979 (R;DK;In Danish)

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A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
Buckling evaluation of System 80+™ containment, 20:879 (R;US)
Chloride and mercury monitors for air toxics measurements, 20:71 (R;US)
Deashing of coal liquids by sonically assisted filtration, 20:48 (R;US)
Dynamic NMR studies of restricted arene rotation in the chromiu tricarbonyl thiophene and selenophene complexes, 20:1363 (R;US)
Liquid chromatographic method for determination of water in soils and the optimization of anion separations by capillary zone electrophoresis, 20:1329 (R;US)
Magnetization and magnetostriction in highly magnetostrictive materials, 20:1145 (R;US)
Methods and opportunities in the recycling of rare earth based materials, 20:1144 (R;US)
Photodissociation and photoionization of organosulfur radicals, 20:2294 (R;US)
Separation of solids from coal liquefaction products using sonic waves, 20:49 (R;US)
The role of microcracking on the crack growth resistance of brittle solids and composites, 20:1280 (R;US)
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Dynamical chiral symmetry breaking in scale invariant quantum electrodynamics in sixth dimensions, 20:2094 (R;UA;In Russian)
Dynamics of structure formation in nonequilibrium systems (Wave Media), 20:2413 (R;UA;In Russian)
Fluctuations and electromagnetic wave scattering in macroscopically agitated plasma: effects of turbulent diffusion, 20:2415 (R;UA)
Fluctuations in macroscopically agitated plasma:quasiparticles and effective temperature, 20:2414 (R;UA)
Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
Nuclear matter equation of state with effects of excluded volume., 20:2218 (R;UA)
On validity of perturbative quantization of the breathing mode in the Skyrme model, 20:2054 (R;UA)
Polarization and intensity of d d-transitions in superconducting copper oxides, 20:1235 (R;UA)
Quasiparticles in magnetized plasma, 20:2416 (R;UA)
The microscopical two axial rotators model for the nucleus with the different neutron and proton shell configurations, 20:2229 (R;UA;In Russian)
The Realization of the Resonating Group Method Algebraic Version for Three-Cluster Systems., 20:2217 (R;UA)

Applied Solar Energy Corp., City of Industry, CA (United States)
Development of concentrator solar cells, 20:691 (R;US)

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Authorization and licensing of nuclear research reactor operating personnel, 20:578 (IA;EG)
Development of nuclear education, 20:2573 (IA;EG)
Nuclear reactor kinetics, 20:829 (IA;EG)
Proceedings of the symposium on the physics and technology of reactors, 20:861 (I;EG)

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Technology for the future, 20:2452 (I;DE;In German)

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Design of neutron beams at the Argonne Continuous Wave Linac (ACWL) for boron neutron capture therapy and neutron radiography, 20:1871 (R;US)

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A fuel cell overview, 20:1006 (R;US)
A mechanistic model for radiation-induced crystallization and amorphization in U_3Si, 20:1169 (R;US)
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Atmosphere influence on in situ ion beam analysis of thin film growth, 20:1291 (R;US)
Cooperative research and development for artificial intelligence based reactor diagnostic system, 20:820 (R;US)
EAGLES 1.1: A microcomputer software package for analyzing fuel efficiency of electric and gasoline vehicles, 20:1072 (R;US)
Effect of gravitation on dynamic response of tanks containing two liquids, 20:220 (R;US)
Effects of battery technologies, driving patterns, and climate comfort control on the performance of electric vehicles, 20:1073 (R;US)
Estimating household fuel oil/kerosine, natural gas, and LPG prices by census region, 20:997 (R;US)
Gasification combined cycle: Carbon dioxide recovery, transport, and disposal, 20:59 (R;US)
Improved high speed maglev design, 20:1081 (PA;US)
In situ analysis of soil at an open burning/open detonation disposal facility: J-Field, Aberdeen Proving Ground, Maryland, 20:1773 (R;US)
LEU ^{99}Mo target fabrication and testing: Overview, status, and plans, 20:839 (R;US)
Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0, 20:218 (R;US)
MHD-flow in slotted channels with conducting walls, 20:2430 (R;US)
On the sputtering of metals and insulators: A nonlinear evolution problem with nonlinear boundary condition, 20:2346 (R;US)
Physics Division annual report, April 1, 1993–March 31, 1994, 20:2201 (R;US)
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Reactive nanophase oxide additions to melt-processed high-$T_c$superconductors, 20:1168 (R;US)
RESRAD benchmarking against six radiation exposure pathway models, 20:1906 (R;US)
Solutions of TEAM Problem No. 13 using integral equations in a sequential and parallel computing environment, 20:2524 (R;US)
Solutions of TEAM problems 13 and 20 using a volume integral formulation, 20:2525 (R;US)
Stability effects on the profiles of vertical velocity and its variance in katabatic flow, 20:717 (R;US)
The effect of a magnetic field on heat transfer in a slotted channel, 20:2429 (R;US)
The role of DSM in a competitive market, 20:985 (R;US)
Topography of neutron scattering from diblock copolymer film, 20:1239 (R;US)

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Effects of glass surface area-to-solution volume ratio (S/V) on glass dissolution: Part one: Relationship between S/V and leachate pH, 20:217 (R;US)

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Cryogenic separation of CO_2 from the flue gas of conventional coal-fired power plants, 20:734 (R;US)

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Ceramic membranes for methane conversion, 20:134 (R;US)
Energy Technology Division research summary – 1994, 20:924 (R;US)
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)
Properties of V-4Cr-4Ti for application as fusion reactor structural components, 20:1100 (R;US)

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A definition of the domains Archaea, Bacteria and Eucarya in terms of small subunit ribosomal RNA characteristics, 20:1863 (R;US)
A divide-and-conquer method for tridiagonalizing symmetric matrices with repeated eigenvalues, 20:2528 (R;US)
A framework for symmetric band reduction and tridiagonalization, 20:2529 (R;US)
A worse-case example using linesearch methods for numerical optimization with inexact gradient evaluations, 20:2527 (R;US)
FORTRAN M: A language for modular parallel programming, 20:2530 (R;US)
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
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Current status of nuclear power development, 20:962 (I;LK)
Current status of SMPRs and manpower development for nuclear power, 20:798 (I;LK)

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Authorization and licensing of nuclear research reactor operating personnel, 20:578 (IA;EG)
Development of nuclear education, 20:2573 (IA;EG)
Nuclear reactor kinetics, 20:829 (IA;EG)
Proceedings of the symposium on the physics and technology of reactors, 20:861 (I;EG)

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Application to plutonium and uranium in safeguards, 20:554 (IA;JP;In Japanese)
Aspect of human food ecology: Development of carbon and nitrogen isotope method, 20:1303 (IA;JP;In Japanese)
BEAM applications to polymer materials, 20:1378 (IA;JP;In Japanese)
Detection of irradiation treatment of foods, 20:1898 (IA;JP;In Japanese)
Development of radiation utilization for economic growth in China, 20:2511 (IA;JP)
Experiences in selling irradiated produce at the retail level, 20:1896 (IA;JP)
Food irradiation in China: With emphasis on market testing and public acceptance, 20:1897 (IA;JP)
Highlights of IAEA activities in the field of radiation application, 20:2510 (IA;JP)
Ion beam technology for nanostructure and interface engineering, 20:2348 (IA;JP;In Japanese)
Isotopic approach to the provenance study of artifacts, 20:1302 (IA;JP;In Japanese)
Measurement technique of radwaste content: For TRU, 20:555 (IA;JP;In Japanese)
Neutron therapy and medical therapy reactor, 20:1879 (IA;JP;In Japanese)
New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry, 20:1304 (IA;JP;In Japanese)
Perspectives of ion beam utilization on plant gene analysis, 20:1917 (IA;JP;In Japanese)
Present status of radiation utilization in Thailand, 20:2512 (IA;JP)
Production and supply of radioisotopes with high-energy particle accelerators current status and future directions, 20:580 (IA;JP)
Sub-half-micrometer device fabrication with synchrotron based X-ray lithography, 20:2314 (IA;JP;In Japanese)
Today and tomorrow of intravenous coronary angiography programme in Japan, 20:1878 (IA;JP)

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Environmental survey at Lucas Heights Research Laboratories, 1991, 20:1702 (R;AU)
Environmental survey at Lucas Heights Research Laboratories, 1992, 20:1703 (R;AU)

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Zeeman spectroscopy of indium acceptor impurity in silicon, 20:1264 (IA;AU)

B

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Descriptions of representative contaminated sites and facilities within the DOE complex, 20:511 (R;US)
The United States Department of Energy Office of Industrial Technology's Technology Benefits Recording System, 20:931 (R;US)

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Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)
Planned mode of operation – PRTR chemical shim, 20:822 (R;US)

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Full scale enzymatic hydrolysis, 20:624 (R;DK;In Danish)

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Calibration of simulated temperature histories of sedimentary basins, 20:104 (R;DE;In German)

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Development of an induction drift chamber for experiments at COSY and high-rate effects according to a new method, 20:1645 (R;DE;In German)
Manipulation of growth mode in the homoepitaxy illustrated by an example of Ag(111), 20:1148 (R;DE;In German)
Measurement of the reaction anti pp→ΦΦ at the experiment JETSET, 20:2168 (R;DE;In German)
Strangeness production in the pp and pp scattering, 20:1646 (R;DE;In German)

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Upper limit determination for the τneutrino mass with OPAL detector, 20:2185 (R;DE;In German)

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A safety system for personnel and equipment protection at the AGS and RHIC, 20:1545 (R;US)
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Approach to compact terawatt CO_2 laser system for particle acceleration, 20:1516 (R;US)
Composition and cycle life of multicomponent AB_5 hydride electrodes, 20:895 (R;US)
Confinement and stability of crystalline beams in storage rings, 20:1530 (R;US)
Crystalline beams, 20:1527 (R;US)
Crystalline beams: The horizontal zigzag: Informal report, 20:1529 (R;US)
E1 and E3 transition rates in the sdf-IBA, 20:2206 (R;US)
Effects of RF side-bands on spectral reproducibility for infrared synchrotron radiation, 20:1528 (R;US)
Estimating the impacts of federal efforts to improve energy efficiency: The case of buildings, 20:1013 (R;US)
Evidence for pervasive phonon structure of nuclear excitations, 20:2204 (R;US)
Few body physics with polarized photons, 20:2234 (R;US)
Gas cooled leads: This report consists of three independent parts, Part 1 covers the theory, Parts 2 and 3 present specific lead designs: Revision, 20:1542 (R;US)
Human factors engineering guidance for the review of advanced alarm systems, 20:830 (R;US)
Image quality, surface statistics and all that, 20:2308 (R;US)
Influence of oxidation on radiation hardness of silicon detectors, 20:1616 (R;US)
Instrumentation for on-line mountain range displays, 20:1543 (R;US)
Issues and approaches in risk-based aging analyses of passive components, 20:871 (R;US)
Local control stations: Human engineering issues and insights, 20:831 (R;US)
Milestone experiments for single pass UV/X-ray FELs, 20:1517 (R;US)
Photoemission and ferromagnetism, 20:2310 (R;US)
Proposed waste form performance criteria and testing methods for low-level mixed waste, 20:240 (R;US)
Robust predictions of the interacting boson model, 20:2205 (R;US)
Semiconductor detectors in nuclear and particle physics, 20:1617 (R;US)
Signal to noise improvements with a new Far-IR rapid-scan Michelson Interferometer, 20:1663 (R;US)
Specification of the figure and finish of EUV mirrors in terms of performance requirements, 20:1428 (R;US)
Specification of the surface figure and finish of optical elements in terms of system performance, 20:1541 (R;US)
Summary of heavy ion theory, 20:2233 (R;US)
Surface x-ray scattering and scanning tunneling microscopy studies at the Au(111) electrode, 20:2309 (R;US)
Technology transfer for industrial production of superconducting magnets for the RHIC project at BNL, 20:1544 (R;US)
The effects of aging on BWR core isolation cooling systems, 20:878 (R;US)
The PROSAIC Laplace and Fourier Transform, 20:2532 (R;US)
Transvenous coronary angiography in humans with synchrotron radiation, 20:1872 (R;US)

Universal correlations of collective observables: Empirical phenomenology and model interpretations, 20:2203 (R;US)
Update on the ATF inverse Cerenkov laser acceleration experiment, 20:1514 (R;US)
Waveguiding by axicon-focused laser beams, 20:1515 (R;US)
Wavelet analysis and accelerator signals, 20:1546 (R;US)

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Survey of reportable events in nuclear power plants in the Federal Republic of Germany. Period covered: 2nd quarter 1994, 20:873 (I;DE;In German)

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Methodology for evaluation of the reliability and safety of interim and final repositories for radioactive waste, 20:281 (I;BG)
Natural sorbents as barriers against migration of radionuclides from radioactive waste repositories, 20:282 (I;BG)
Principles and criteria for creation of a concept for national radwaste repository, 20:277 (I;BG)
Research procedure and criteria for analysis and choice of variants for construction of national radioactive waste repository, 20:278 (I;BG)
Site selection procedure for high level radioactive waste disposal in Bulgaria, 20:279 (I;BG)

C

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Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

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Development of paradigms for the dynamics of structured populations, 20:1862 (R;US)

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Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)

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Theoretical particle physics: Progress report, FY 1994, 20:2028 (R;US)

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Work plan for the treatability study for PCB dehalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:1790 (R;US)

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New regulation of radioactive materials transport, 20:187 (R;FR;In French)

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A better approach to the MDNBR concept, 20:1464 (R;FR)
Droplet size and velocity at the exit of a nozzle with two-component near critical and critical flow, 20:1463 (R;FR)
Interfacial friction in low flowrate vertical annular flow, 20:1465 (R;FR)
Loss of residual heat removal during mid-loop operation: Bethsy experiments, 20:758 (R;FR)
Modular bench for non destructive controls, 20:1481 (R;FR;In French)
On the prediction of flooding phenomenon with the Cathare code, 20:748 (R;FR)
One component, volume heated, boiling pool thermohydraulics, 20:790 (R;FR)
PWR accident management realated tests: some Bethsy results, 20:757 (R;FR)
Reflux condenser mode with non-condensible gas: assessment of Cathare against Bethsy test 7.2C, 20:759 (R;FR)
The effect of grid assembly mixing vanes on critical heat flux values and azimuthal location in fuel assemblies, 20:760 (R;FR)
The top-down reflooding model in the Cathare code, 20:761 (R;FR)

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A new paradigm for particle tracking velocimetry, based on graph-theory and pulsed neural network, 20:1462 (R;FR)
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Elementary migration around the Oklo nuclear reactors. Implications for high level radioactive wastes storage, 20:1774 (R;FR;In French)
Hydrodynamic operation analysis of a pulse with disks and rings column, 20:1298 (R;FR;In French)
Systemic representation of a production system: the Sagace method, 20:222 (R;FR;In French)
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The qualitative and fuzzy contributions for industrial process diagnostic. Application in the DIAPASON project, 20:163 (R;FR;In French)

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On different models to deal with collisions between ionic and electronic populations, 20:2402 (R;FR;In French)

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Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)
Determination of the neutron and gamma dose rates and heatings induced by radioactive wastes in repository geological salt formations, 20:221 (R;FR)
Extension of Fakir, Kahina, a computer code of kinsfolk actinides heat irradiation neutron and activity, 20:188 (R;FR)
Radiation shielding calculation for the MOX fuel fabrication plant Melox, 20:814 (R;FR)

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Model of electronic energy relaxation in the test-particle Monte Carlo method, 20:148 (R;FR)

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Dynamic compensation of the silver self-powered neutron detector in the ramp program at Osiris reactor, 20:824 (R;FR)
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OSIRIS: the first M.T.R. with a new instrumentation and control system based on digital logic of vote, 20:823 (R;FR)
Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants, 20:755 (R;FR;In French)

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Neutron spectrum effect on PV-steels embrittlement: dosimetry and qualification of irradiation locations in Osiris and Siloe reactors, 20:756 (R;FR)

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Uranium Enrichment, an overview, 20:147 (R;FR)

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Measurement and evaluation of combined solar heating system for space and water heating at Egebjerggaard 3 (Skotteparken), 20:699 (R;DK;In Danish)

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Microbial growth in district heating pipes - preliminary investigation, 20:1061 (R;DK;In Danish)

CeraMem Corp., Waltham, MA (United States)
Ceramem filters for removal of particles from hot gas streams, 20:60 (R;US)

Ceylon Electricity Board, Colombo (Sri Lanka)
Case Studies, 20:799 (I;LK)
Electricity demand forecasting techniques, 20:891 (I;LK)
Integrated operation of hydro thermal system, 20:636 (I;LK)

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Test trial radiation vulcanization of natural rubber latex in Jakarta Indonesia, 20:586 (I;LK)

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A study of using polythiol compounds and 2-ethyl-hexyl-acrylate with carbon tetrachloride as sensitizers for radiation vulcanization of natural rubber latex, 20:1379 (I;TH;In Thai)
Development of a personal digital dosimeter, 20:1631 (I;TH;In Thai)
Labelling of meta-iodobenzylguanidine with iodine-131 (I-131-MIBG) for adrenal gland diagnosis, 20:1414 (I;TH;In Thai)
Radioiodination of testosterone 3-(0-carboxylmethyl) hydroxylamine tyrosine methyl ester, 20:1415 (I;TH;In Thai)
Treatment of low-level radioactive cesium-137 and technetium-99 liquid wastes by inorganic ion-exchangers, 20:276 (I;TH;In Thai)

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E1 and E3 transition rates in the sdf-IBA, 20:2206 (R;US)
Universal correlations of collective observables: Empirical phenomenology and model interpretations, 20:2203 (R;US)

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A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994, 20:78 (R;US)

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Uranium in the southern Sao Francisco Craton and marginal belts, 20:143 (I;BR)

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D

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Utilization of straw- and wood pellets for fuelling of small heating systems, 20:628 (R;DK;In Danish)

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Combined heat pump and solar heating system for villas: Phase 1, 20:700 (R;DK;In Danish)

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BNFL Sellafield further public consultation: Summary of responses, 20:185 (I;GB)

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A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S), 20:2146 (R;DE)
Anomalous selfinteractions of gauge bosons in WWZ and ZZZ production at NLC, 20:2118 (RA;DE)
Approximation for on-shell W-pair production at high and intermediate energies, 20:2111 (RA;DE)
Aspects of scalar lepton search, 20:2137 (RA;DE)
Azimuthal distributions for the process $e^+e^- \rightarrow t$ anti $t \rightarrow \mu^+\mu^- X$, 20:2124 (RA;DE)
Bound on the lightest Higgs mass in the minimal ηmodel at one loop, 20:2188 (RA;DE)
Canonical formulation of gravitation- and supergravitation theories, 20:2008 (R;DE;In German)
Changed Higgs boson discovery potential at a 500 GeV e^+e^- linear collider, 20:2109 (RA;DE)
Comment on the average momentum of top quarks in the threshold region, 20:2076 (RA;DE)
Comparison of energy flows in deep inelastic scattering events with and without a large rapidity gap, 20:2145 (R;DE)
Correlations in Higgs production and decay as a probe of CP-violation in the scalar sector, 20:2104 (RA;DE)
CP violation in Higgs decays due to Majorana neutrinos, 20:2103 (RA;DE)
CP violation in top quark pair production, 20:2125 (RA;DE)
Deep inelastic $e\gamma$-scattering, with beamsstrahlung, 20:1619 (RA;DE)
Detecting the non-minimal supersymmetric Higgs boson at the NLC, 20:2187 (RA;DE)
Discovering supersymmetry with electron and photon beams, 20:2138 (RA;DE)
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Energy of W distribution in top quark decays, 20:2121 (RA;DE)
Experimental aspects of rare top quark decays at future e^+e^- linear colliders, 20:2123 (RA;DE)
Experimental requirements for the study of electroweak gauge bosons, 20:1618 (RA;DE)
Gauge invariance in off-shell W pair production, 20:2110 (RA;DE)
Gauge-boson production in electron-photon collisions, 20:2114 (RA;DE)
Higgs bosons: Intermediate mass range at e^+e^- colliders, 20:2101 (RA;DE)
Higgs effects in top production, 20:2126 (RA;DE)
Initial stet radiation corrections to off-shell W-pair production in e^+e^--annihilation, 20:2112 (RA;DE)

Invisibly decaying Higgs boson at e^+e^- collisions, 20:2105 (RA;DE)
Localized endomorphisms of the chiral Ising model, 20:2032 (R;DE)
Machine, physics and detector (plus final focus) interplay at the next e^+e^- linear collider, 20:1620 (RA;DE)
Massless particles, electromagnetism, and Rieffel induction, 20:2077 (R;DE)
Measurement of the decay fractions of D* mesons, 20:2144 (R;DE)
Measurements in the $e^+e^- \rightarrow t$ anti t threshold region, 20:2128 (RA;DE)
Model independent constraints on extra Z bosons at a 500 GeV e^+e^- collider, 20:2130 (RA;DE)
Pair neutral gauge boson production and Higgs signal in γ-γcollisions: $\gamma\gamma \rightarrow \gamma\gamma$, $\gamma\gamma \rightarrow$ ZZ, $\gamma\gamma \rightarrow$ HH, 20:2141 (RA;DE)
Parameterizations of the W anomalous self-couplings, 20:2075 (RA;DE)
Perspectives of neutral supersymmetric Higgs boson searches at a 500 GeV e^+e^- linear collider, 20:2106 (RA;DE)
Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha_s^2)$, 20:2143 (R;DE;In German)
Physics from the first year of H1 at HERA, 20:2147 (R;DE)
Production and decay of t anti t pairs in the threshold region, 20:2127 (RA;DE)
Production of a Higgs with two gauge bosons, 20:2102 (RA;DE)
Radiative corrections in the MSSM Higgs sector: masses and fermionic decays, 20:2186 (RA;DE)
Radiative corrections to $e^+e^- \rightarrow \mu^+\mu^-$ and the top decay $t \rightarrow bW$ in the Two Higgs doublet model, 20:2108 (RA;DE)
Radiative corrections to leptoquark pair production in e^+e^- annihilation, 20:2135 (RA;DE)
Radiative corrections to the supersymmetric Higgs sector, 20:2107 (RA;DE)
Search for neutral particles in nonminimal SUSY model, 20:2189 (RA;DE)
Single production of new leptons, 20:2134 (RA;DE)
Single W production at NLC, 20:2116 (RA;DE)
Strong resonances effects at future e^+e^- colliders, 20:2133 (RA;DE)
Studies of QCD in e^+e^- collisions at 500 GeV, 20:2129 (RA;DE)
Supersymmetric decays of the top quark, 20:2122 (RA;DE)
T-odd asymmetry in chargino pair production processes, 20:2139 (RA;DE)
Test of internal halo targets in the HERA proton ring, 20:1602 (R;DE)
Testing the anomalous ZZ$\gamma$and Z$\gamma\gamma$vertices in $e\gamma \rightarrow eZ$, 20:2119 (RA;DE)
Tests of trilinear couplings of the vector bosons at future e^+e^--collider, 20:2115 (RA;DE)
The BESS model at e^+e^- colliders, 20:2132 (RA;DE)
The proton collimation system of HERA, 20:1601 (R;DE)
The top width: Theoretical update, 20:2120 (RA;DE)
Topological zero modes in Monte Carlo simulations, 20:2078 (R;DE)
Trilinear and quadrilinear W couplings in triple vector production, 20:2117 (RA;DE)
Uncertainties in in calculations of the $\gamma\gamma$minijet cross section, 20:2140 (RA;DE)
Vector bosons and Higgs bosons as signatures for charginos and neutralinos, 20:2136 (RA;DE)
W, Z and H bosons in the three particle final states production at TeV energy γe and $\gamma\gamma$colliders, 20:2142 (RA;DE)
WOPPER - a Monte Carlo event generator for W off-shell pair production including higher order electromagnetic radiative corrections, 20:2113 (RA;DE)
Z - Z' and exotic lepton mixing in $e^+e^- \rightarrow W^+W^-$ at high energy with polarized beams, 20:2131 (RA;DE)

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Workshop on climate database systems, 20:2567 (R;DE)

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200 Area weekly report, 20:167 (R;US)
200 Area weekly report, 20:168 (R;US)
200 Area weekly report, 20:169 (R;US)
200 Area weekly report, 20:170 (R;US)
200 Area weekly report, 20:171 (R;US)
200 Area weekly report, 20:172 (R;US)
200 Area weekly report, 20:173 (R;US)
200 Area weekly report, 20:174 (R;US)
200 Area weekly report, 20:175 (R;US)
200 Area weekly report, 20:176 (R;US)
200 Area weekly report, 20:177 (R;US)
200 Area weekly report, 20:178 (R;US)
200 Area weekly report, 20:179 (R;US)
200 Area weekly report, 20:180 (R;US)
200 Area weekly report, 20:181 (R;US)
200 Area weekly report, 20:182 (R;US)
200 Area weekly report, 20:183 (R;US)
200 Area weekly report, 20:184 (R;US)
200 Area weekly report, 20:165 (R;US)
200 Area weekly report, 20:166 (R;US)
Personnel requirements, 20:942 (R;US)
Preliminary engineering studies, Savannah River Plant, quarterly report July 1954, 20:154 (R;US)
Summary of irradiation data on U-Al and Li-Al alloys, 20:153 (R;US)
Weekly report - 100 Areas, 20:853 (R;US)
Weekly report - 100 Areas, 20:157 (R;US)
Weekly report - 100 Areas - April 7, 1955, 20:852 (R;US)
Weekly report - 100 Areas - April 14, 1955, 20:155 (R;US)
Weekly report - 100 Areas - April 28, 1955, 20:156 (R;US)
Weekly report - 100 Areas - January 27, 1955, 20:846 (R;US)
Weekly report - 100 Areas - March 10, 1955, 20:848 (R;US)
Weekly report - 100 Areas - March 17, 1955, 20:849 (R;US)
Weekly report - 100 Areas - March 24, 1955, 20:850 (R;US)
Weekly report - 100 Areas - March 31, 1995, 20:851 (R;US)
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Incidents that require emergency operating procedures, 20:872 (R;US)
Mid-year financial plan, fiscal year 1954 process development, 20:842 (R;US)
Minutes of Technical Division steering committee meeting August 11, 1953, Wilmington, 20:841 (R;US)
Minutes of Technical Division Steering Committee Meeting December 13, 1955, Savannah River Laboratory, 20:254 (R;US)
Minutes of Technical Division Steering Committee Meeting, May 10, 1955, Savannah River Laboratory, 20:844 (R;US)
Project 8980, Savannah River Plant, 200 Area: Water handling system, segregation of process water, 20:836 (R;US)
Project 8980, Savannah River Plant, 105-C power calculator, 20:825 (R;US)
Report of trip to Los Alamos, Albuquerque Operations Office, and ACF Industries, September 17–19, 1956, 20:1434 (R;US)
Travel to Battelle Memorial Institute: Trip report, September 17, 24, and October 8, 1953, 20:152 (R;US)
Weekly report November 18 to December 1, 1955: 300-M Area, Savannah River Plant, 20:845 (R;US)
Weekly report, 100 Areas, June 2, 1955, 20:855 (R;US)
Weekly report, 100 Areas, May 26, 1955, 20:854 (R;US)

[Discussion by R. M. Evans at a meeting held with the members of the Military Liaison Committee on February 17, 1954], 20:843 (R;US)
[Dispersion of fission products], 20:742 (R;US)

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Fuzzy modelling of a gas furnace, 20:1494 (I;DE;In German)

E

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Energy profiles of selected Latin American and Caribbean countries: Report series No. 2, 20:974 (R;US)
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Visible photoluminescence from hydrogenated silicon particles suspended in a silane plasma, 20:2418 (R;CH)

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A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory, 20:259 (R;US)
A summary and assessment of oxidation driven volatility experiments at the INEL and their application to fusion reactor safety assessments, 20:2434 (R;US)
Arc melter demonstration baseline test results, 20:268 (R;US)
Assessment of CONTAIN and MELCOR for performing LOCA and LOVA analyses in ITER, 20:2437 (R;US)
Assessment of database for interaction of tritium with ITER plasma facing materials, 20:2436 (R;US)
Benchmarking of computer codes and approaches for modeling exposure scenarios, 20:239 (R;US)
CHEMCON user's manual: Version 1.1, 20:2435 (R;US)
Corrosion of spent Advanced Test Reactor fuel, 20:816 (R;US)
Criticality safety evaluation for TRU waste in storage at the RWMC, 20:496 (R;US)
Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal, 20:236 (R;US)
Electric and Hybrid Vehicle Program: Site Operator Program: Quarterly progress report, October–December, 1993 (first quarter of fiscal year 1994), 20:1077 (R;US)
Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)
Events in time: Basic analysis of Poisson data, 20:803 (R;US)
GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
Hits per trial: Basic analysis of binomial data, 20:802 (R;US)
INEL storage facility for sealed sources from the commercial sector, 20:452 (R;US)
Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)
Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data, 20:256 (R;US)
NESTLE: Few-group neutron diffusion equation solver utilizing the nodal expansion method for eigenvalue, adjoint, fixed-source steady-state and transient problems, 20:801 (R;US)
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Data acquisition for the CDF SVX II upgrade, 20:1622 (R;US)
Derivation of coupling impedance from the wake potential of a finite bunch, 20:1533 (R;US)
Emittance growth due to negative-mass instability above transition, 20:1532 (R;US)
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Measurement of the B cross section at CDF via B semileptonic decays, 20:2151 (R;US)
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Measurement of W and Z production cross-sections in $p\bar{p}$ collisions at $\sqrt{s} = 1.8$ TeV, 20:2154 (R;US)
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Optimizing the length of the stores and related effects, 20:1534 (R;US)
Recent results from E665, 20:2156 (R;US)
Search for Centauro events in the DO Detector at Fermilab collider, 20:2155 (R;US)
Studies of prompt photon production and multijet production at the Tevatron Collider, 20:2153 (R;US)
The D0 Level 1.5 Calorimeter Trigger, 20:1624 (R;US)
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Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica, 20:1750 (R;US)
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A method of gallium purification from arsenic, bismuth, cadmium and iron by gallium remelting under synthetic slags, 20:597 (IA;PL)
A study of analytical properties of chelating sorbents obtained by immobilization of chelating agents on solid supports. Analytical properties of thionalide loaded acrylic resin, 20:1325 (IA;PL)
A therapy level α-alanine dosimetry, 20:1887 (IA;PL)
A trail of computer simulation of semiconductor detector gamma-ray spectra for detectability and precision prediction in instrumental neutron activation analysis, 20:1321 (IA;PL)
An attempt of determination of heavy metals content in environmental samples by low resolution XRF technique, 20:1316 (IA;PL)
An ESR study of gamma irradiated polycrystalline methionine-containing peptides, 20:1399 (IA;PL)
An ESR study of sulfur-containing amino acids in aqueous frozen solution, 20:1393 (IA;PL)
Analysis of alloys by energy dispersive X-ray fluorescence method, 20:1326 (IA;PL)
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Anisotropic quantum spin fluid and anisotropic quantum spin glass formation in La-cuprate-based catalysts for phenol oxidation, 20:1351 (IA;PL)
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Application of tracer method for selection of optimal location of industrial effluent outfall into the river, 20:593 (IA;PL)
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Comparison of the resistance of integrated circuits to various types of nuclear radiation, 20:1662 (IA;PL)
Computer operated 256 channel pulse analyser for scintillation and proportional detectors, 20:1640 (IA;PL)
Computer simulation of binary alloy structure in the Ising model scheme, 20:1139 (IA;PL)
Control and data acquisition system of electron linear accelerator for radiation processing, 20:1553 (IA;PL)
Conversion of free radicals upon annealing of x-irradiated single crystal of cholest-4-en-3-one, 20:1385 (IA;PL)
Covalency of scandium(III) as manifested in the enthalpies of solution of anhydrous rare earth halides, 20:1359 (IA;PL)
Defects in epitaxial GaInP, 20:1219 (IA;PL)
Determination of antimony in natural waters by neutron activation analysis after separation on a chelating sorbent, 20:1322 (IA;PL)
Determination of hydrate numbers from solubility data, 20:1358 (IA;PL)

Dispersive kinetics of radiation-induced species in condensed media, 20:1391 (IA;PL)
Elaboration of the universal method of radiochemical separation of molybdenum from irradiated biological samples for NAA purposes, 20:1323 (IA;PL)
Electron beam induced purification of air by removing the volatile organic compounds, 20:600 (IA;PL)
Electron interaction with stabilizing matrix, 20:1383 (IA;PL)
Electron spin-echo studies of spin-spin relaxation processes, 20:1353 (IA;PL)
ENDOR study of free radicals in X-irradiated glutarimide, 20:1392 (IA;PL)
EPR in fullerenes, 20:1350 (IA;PL)
EPR investigations of iminoxy free radicals and paramagnetic metal-oxime systems, 20:1352 (IA;PL)
EPR of a nitroxide adsorbed on SiO_2 and La_2O_3, 20:1355 (IA;PL)
EPR spectroscopy as a tool for radiation exposure measurements on living animals in environment after nuclear contamination, 20:1402 (IA;PL)
EPR studies of reduced Zn-chlorins and their isotope substituted analogs, 20:1904 (IA;PL)
ESR and pulse radiolysis on the free-radical-induced oxidation of phloroglucinol in aqueous solution, 20:1388 (IA;PL)
ESR studies of radiation damage of DNA and proteins, 20:1387 (IA;PL)
ESR studies of the generations and reactions of free radicals in chemical and biochemical systems, 20:1384 (IA;PL)
ESR study of radiation induced radicals in solid peptides, 20:1394 (IA;PL)
Extraction of lanthanides, americium(III) and yttrium by TBP from thiocyanate and azide solutions, 20:1317 (IA;PL)
High-LET radiolysis. Pt.1. A facility and its testing, 20:1403 (IA;PL)
High-LET radiolysis. Pt.2. To "oxygen in heavy ion track hypothesis", 20:1404 (IA;PL)
High-LET radiolysis. Pt.3. Crystalline α-L-alanine irradiated on ^{12}C and ^{25}Mg ion beams, 20:1405 (IA;PL)
Identification of 16. century paintings of the Malopolska School by means of IRNAA, 20:1314 (IA;PL)
Implantation induced amorphization in Si, GaAs, and GaAsP, 20:2356 (IA;PL)
Indirect chiral effect alanines and tryptophans, 20:1408 (IA;PL)
Industrial gauge of sulphuric acid concentration, 20:603 (IA;PL)
Influence of hydration of selected gadolinium β-diketonates on their EPR spectra, 20:1354 (IA;PL)
Interaction of vanadium pentoxide with H-ZSM-5 zeolite investigated by EPR, 20:1357 (IA;PL)
Investigation of industrial effluent dilution and self-purification in the river, 20:592 (IA;PL)
Investigation of structures and properties of new materials from amino triazole complexes of transition metals, 20:1361 (IA;PL)
Isotope gauge and computer program for quality control of thickness coating process, 20:602 (IA;PL)
Isotopic density gauge of ceramic bodies, 20:605 (IA;PL)
Liquid-liquid partition and hydration of some bis and tris-β-diketonates, 20:1318 (IA;PL)
Magnetism of lanthanide intermetallic compounds, 20:1221 (IA;PL)
Metabolism of arachidonic acid in murine lymphoma L5178Y sublines radiation resistant of sensitive to ionizing radiation, 20:1923 (IA;PL)
Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content, 20:58 (IA;PL)
Multi-points mobile radiotracer laboratory, 20:604 (IA;PL)
Neutron spectroscopy studies of amino-acids, 20:2340 (IA;PL)
OH radicals induced oxidation of sulfur-containing amino acids. An ESR study, 20:1397 (IA;PL)
Particle track membranes (PTM) examinations by small-angle X-ray scattering, 20:1486 (IA;PL)
Photochemical and radiation-chemical aspects of matrix acidity effects on organic sulphur compounds, 20:1401 (IA;PL)
Polarization effects on the electron density of lone pairs, 20:2305 (IA;PL)
Process of formation of gels in the systems (Y^{3+}-Ba^{3+}-Cu^{2+}) or (Bi^{3+}-Pb^{2+}-Sr^{2+}-Ca^{2+}-Cu^{2+})-CH_3COO-NH_4OH-H_2O and theirs transformation to high temperature superconductors (HTS): $YBa_2Cu_3O_{7-x}$ (YBCO) $Bi_2Sr_2Ca_1Cu_2O_{8+\delta}$ (BSCCO 2212), Bi_2Sr_2 $Ca_2Cu_3O_{10+\delta}$ (BSCCO 2223) and $Bi_{1.6}Pb_{0.4}Sr_2$ $Cu_3O_{10+\delta}$ (BSCCO 2223), 20:1220 (IA;PL)
Pulse radiolysis of acetonic solutions in presence of silver salts, 20:1406 (IA;PL)
Pulse radiolysis studies of short-lived species in solid amino acids as precursors of radicals detected by ESR, 20:1386 (IA;PL)
Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules, 20:1390 (IA;PL)
Radiation - induced silver agglomeration in A zeolites, 20:1382 (IA;PL)
Radiation stability of crown ether - metal ions complexes, 20:1389 (IA;PL)
Radiotracer investigation of the six-drawing machine glass furnace for flat glass production, 20:594 (IA;PL)
Reactivity of halogenorganic radicals in DMSO solution, 20:1400 (IA;PL)
Reduced sensitivity to camptothecin of L5178Y sublines is accompanied by diminished DNA damage, 20:1921 (IA;PL)
Sensitivity to inhibitors of type II topoisomerase from mouse L5178Y lymphoma sublines: Resistant and sensitive to X radiation, 20:1922 (IA;PL)
Separation factors of H/D and $^{16}O/^{18}O$ in permeation of natural water through PTFE membranes, 20:1320 (IA;PL)
Separation of yttrium from strontium radionuclides on α-crystalline antimony peroxide, 20:1319 (IA;PL)
Silver-centred radicals in A zeolites, 20:1398 (IA;PL)
Some properties of foils and PTM made of different polymers irradiated by electrons, 20:598 (IA;PL)
Spurs in solids, 20:1407 (IA;PL)
Studies on the detection of radiation treated foodstuffs by the EPR spectroscopy, 20:1395 (IA;PL)
Studies on the structure and properties of steel and ceramics surfaces modified by high intensity pulsed ion beams, 20:1484 (IA;PL)
The applied L-glutamine in gamma and electron dosimetry, 20:1639 (IA;PL)
The dynamics of extraction column, 20:595 (IA;PL)
The effects of new fuel additives on carbon deposition and wear of combustion engines, 20:596 (IA;PL)
The elaboration of the method of phosphorus and potassium determination in plant materials with the use of 14 MeV neutron generator in the new constructed laboratory dedicated for nitrogen determinations, 20:1324 (IA;PL)
The EPR detectability levels in mollusc's shells exposed to the action of ionizing radiation, 20:1396 (IA;PL)
The ESR-spectroelectrochemical detection of organometallic W(+1) complex compounds, 20:1356 (IA;PL)
The laboratory unit of SO_2 and NO_x removal from flue gases by simultaneous use electron beam and streams of microwave energy, 20:601 (IA;PL)
The pilot plant for electron beam flue gas treatment. Two-stages irradiation test, 20:599 (IA;PL)
The possibility of application of ion chromatography for the determination of nitrogen and sulfur oxides and some other compounds in combustion flue gases after electron beam treatment, 20:591 (IA;PL)
The wide-range X-ray scattering of structural changes in PETP occurring under heavy ions irradiation, 20:2357 (IA;PL)
Track structure analysis of survival of two mouse lymphoma L5178Y cell strains of different radiation sensitivity, 20:1920 (IA;PL)
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AFR storage in Germany - Possibilities and prospects, 20:197 (RA;XA)

Afterheat removal for HTR-10 test module under accident conditions, 20:775 (RA;XA)

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Application of isotopes and radiation for industry and environmental protection, 20:588 (IA;PL)

Assistance to nuclear power user countries under the IAEA Technical Co-operation Programme, 20:2487 (RA;XA)

Atucha 1 Nuclear Power Station, 20:2464 (RA;XA)

Away-from-reactor (AFR) storage concepts - The Indian experience, 20:200 (RA;XA)

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Bases for the MHTGR source term and containment concepts, 20:772 (RA;XA)

Briefing notes on Kazakhstan, 20:2503 (RA;XA)

CASCAD dry storage concept for spent fuel, 20:196 (RA;XA)

Cernavoda NPP operations training programs, 20:2505 (RA;XA)

Communication dated 10 March 1994 received from the Permanent Mission of the Federal Republic of Yugoslavia (Serbia and Montenegro), 20:573 (R;XA;In Arabic, Chinese, English, French)

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Communications received from Members regarding the export of nuclear material and of certain categories of equipment and other material, 20:550 (R;XA;In Arabic, Chinese, English, French)

Comparison of different calculational methods for spent fuel storage criticality calculations, 20:204 (RA;XA)

Conception to create the system for psychophysiological maintenance of operators' labor in power plants, 20:2484 (RA;XA)

Convention on nuclear safety, 20:2574 (R;XA;In Arabic, Chinese, English, French)

Convention on nuclear safety. Final act, 20:2575 (R;XA;In Arabic, Chinese, English, French)

Cooperation with CIS in training of NPP-Personnel. (Supported by German Government and European Community), 20:2500 (RA;XA)

Current situation of spent fuel management in the Laguna Verde Nuclear Power Plant, Veracruz, Mexico, 20:202 (RA;XA)

Current status of spent fuel management in the Republic of Korea and design concept of the interim spent fuel storage facility, 20:201 (RA;XA)

Description of training activities and re-training system for nuclear professionals at the Paks Nuclear Power Plant, Hungary, 20:2502 (RA;XA)

Development of an inactive heat removal system for high temperature reactors, 20:784 (RA;XA)

Development of nuclear power in Sweden, 20:965 (IA;PL)

Distribution of the decay heat in various modul HTRs and influence on peak fuel temperatures, 20:774 (RA;XA)

Education and training program at Hamaoka Nuclear Power Station, 20:2478 (RA;XA)

ENIKO MIFI theses for discussion on implementation of training assistance, 20:2507 (RA;XA)

Environment, 1980-1993: International Atomic Energy Agency publications, 20:2513 (I;XA)

Finnish programme and experience on training and qualification for nuclear power plant personnel, 20:2471 (RA;XA)

Flow schemes and design features of HTGR residual heat removal systems, 20:776 (RA;XA)

German system for training and qualification of NPP-personnel, 20:2474 (RA;XA)

Guidelines for multipurpose data systems for nuclear power plants, 20:743 (R;XA)

Heat transfer in the upper part of the HTTR pressure vessel during loss of forced cooling, 20:783 (RA;XA)

IAEA activities in nuclear power plant personnel training and qualification, 20:2490 (RA;XA)

IAEA programmes on the safety of nuclear power plants in Easter Europe and countries of the former Soviet Union, 20:2493 (RA;XA)

Impact of increasing MHTGR power on passive heat removal, 20:778 (RA;XA)

Implementation of systematic training approach in Kozloduy Training Centre - Current situation. Presentation of Bulgaria, 20:2496 (RA;XA)

Information on the projects of technical assistance in personnel training for Russian NPPS. Presentation of Russia, 20:2506 (RA;XA)

Interregional and regional training courses 1994, 20:2488 (RA;XA)

Modeling and analysis of heat transfer from the MHTGR core through a steel reactor vessel to the reactor cavity cooling system, 20:781 (RA;XA)

Monitored retrievable storage facility conceptual design, 20:206 (RA;XA)

National arrangement to handle nuclear emergencies, 20:2578 (IA;PL)

National programme and experience on training and qualification for nuclear plant personnel, 20:2465 (RA;XA)

Net energy analysis of different electricity generation systems, 20:796 (R;XA)

Nuclear and radiological safety, 1980-1993: International Atomic Energy Agency publications, 20:1918 (I;XA)

Nuclear energy and natural environment. Information seminar, 20:587 (I;PL)

Nuclear energy and the natural environment, 20:1884 (IA;PL)

Nuclear energy in Ukraine. State and problems, 20:967 (IA;PL)

Nuclear power in Finland. Present status and trends, 20:969 (IA;PL)

Nuclear power in Germany, 20:968 (IA;PL)

Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)

Nuclear power, nuclear fuel cycle and waste management, 1980-1993: International Atomic Energy Agency publications, 20:2514 (I;XA)
Nuclear power. Status and development trends, 20:963 (IA;PL)
Nuclear techniques in food and agriculture with special reference to environmental protection, 20:1905 (IA;PL)
Nuclear technology in hydrological and environmental research, 20:589 (IA;PL)
Passive decay and residual heat removal in the MHTGR, 20:777 (RA;XA)
Passive heat removal experiments for an advanced HTR-module reactor pressure vessel and cavity design, 20:785 (RA;XA)
Preparation and conduct of simulator training in Germany, 20:2476 (RA;XA)
Presentation of decay heat removal computer codes used for gas cooled reactors, 20:780 (RA;XA)
Presentation of Germany, 20:2501 (RA;XA)
Presentation of the G-24 technical working group on training, 20:2495 (RA;XA)
Principles of decay heat removal in reactor technology - Present status and future prospects, 20:744 (RA;XA)
Programme and experience on training and qualification for nuclear power plant personnel in China, 20:2469 (RA;XA)
Progress with Scottish Nuclear's proposals for the construction of dry fuel stores at Torness and Hunterston 'B' power stations, 20:205 (RA;XA)
Quality assurance technical cooperation and training, 20:2492 (RA;XA)
R and D on spent fuel storage in Japan, 20:199 (RA;XA)
Radiation and health, 20:1886 (IA;PL)
Radiation technologies and nuclear techniques friendly to man and environment, 20:590 (IA;PL)
Radioactive waste management, 20:283 (IA;PL)
Referential approach, 20:2473 (RA;XA)
Report of the Chernobyl state committee of the Republic of Belarus, 20:837 (IA;PL)
Report to: 3. steering committee meeting of the extrabudgetary programme on safety of WWER NPPs, 20:763 (RA;XA)
Russian programme and experience on nuclear power plant personnel training system development, 20:2481 (RA;XA)
Safety criteria and provisions for the evacuation of residual heat from graphite gas cooled reactors, 20:771 (RA;XA)
Safety features of proposed concepts for spent fuel dry interim storage, 20:194 (RA;XA)
SANA experiments related to self-operating removal of decay heat, 20:787 (RA;XA)
Selection of the type of spent fuel storage at Paks NPP, 20:198 (RA;XA)
Spanish national programme and experience on training and qualification for nuclear power plant personnel, 20:2482 (RA;XA)
Spent fuel management and disposal programme (SFMDP) strategy for the Czech Republic, 20:193 (RA;XA)
Spent fuel management in the Slovak Republic, 20:203 (RA;XA)
Spent nuclear fuel in the Czech Republic, 20:272 (RA;XA)
Statement dated 1 June 1994 by a spokesman for the Foreign Ministry of the Democratic People's Republic of Korea, 20:575 (R;XA;In Arabic, Chinese, English, French)
Study on the design of new spent fuel intermediate storage facilities in France, 20:195 (RA;XA)
Survey of programme and experience on training and qualification for nuclear power plant personnel in Belgium, 20:2466 (RA;XA)
System for training and qualification of nuclear power plant personnel in Pakistan, 20:2480 (RA;XA)
System of NPP personnel training in Slovak Republic, 20:2508 (RA;XA)
Tecnatom training program. Presentation of Spain, 20:2509 (RA;XA)
Test apparatus of cooling panel system for MHTGR, 20:786 (RA;XA)
The Agency's technical co-operation activities in 1993: Report by the Director General, 20:2462 (R;XA)
The annual report for 1993, 20:2461 (R;XA)
The application of nuclear technology in cancer radiotherapy, 20:1885 (IA;PL)
The Czech Republic Nuclear Power Programme present situation and its development, 20:2470 (RA;XA)
The Czech Republic programme and experiences on training and qualification for NPPs personnel, 20:2499 (RA;XA)
The energy issue in Sweden. Can society handle technology poorly understood by its citizens?, 20:964 (IA;PL)
The German center for the simulator training of nuclear power plant personnel, 20:2475 (RA;XA)
The management of site contamination, 20:1701 (IA;PL)
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2468 (RA;XA)
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2498 (RA;XA)
The Treaty for the prohibition of nuclear weapons in Latin America and the Caribbean (Tlatelolco Treaty), 20:1096 (R;XA;In Arabic, Chinese, English, French)
The UK programme and experience on training and qualification for nuclear power plant personnel, 20:2485 (RA;XA)
The ultimate safety of the HTR-Module during hypothetical accidents, 20:773 (RA;XA)
Training and qualification of NPP personnel in Romania, 20:2504 (RA;XA)
Training and qualification of nuclear power plant personnel in Brazil, 20:2467 (RA;XA)
Training for qualification and competence of nuclear power plant personnel in India, 20:2477 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993, 20:827 (R;XA)
Training for the qualification and competence of nuclear power plant personnel in Mexico, 20:2479 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel in Sweden, 20:2483 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel in the United States, 20:2486 (RA;XA)
Training of nuclear power plant personnel in Canada, 20:2497 (RA;XA)
Training related activities, 20:2494 (RA;XA)
Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993, 20:828 (R;XA)
Training-related infrastructure development and evaluation of training performance, 20:2491 (RA;XA)
Trends in safety criteria for future reactor plants, 20:745 (RA;XA)
[Guidelines for IAEA fellows and trainees], 20:2576 (RA;XA)
[Technical Cooperation programmes organized by Division of Nuclear Power], 20:2489 (RA;XA)

International Atomic Energy Agency, Vienna (Austria). Div. of Technical Co-operation Programmes
Briefing notes on Kazakhstan, 20:2503 (RA;XA)

International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee
Progress in fission product nuclear data. No. 14: Information about activities and requirements in the field of measurements and compiliations/evaluations of fission product nuclear data (FPND), 20:2242 (R;XA)

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Index of nuclear data libraries available from the IAEA Nuclear Data Section, 20:2571 (R;XA)

International Centre for Theoretical Physics, Trieste (Italy)
"Charge-Dyon" system as the reduced oscillator, 20:1979 (R;XA)
A multivariate analysis of intrinsic soil components influencing the mean-weight diameter of water-stable aggregates, 20:1798 (R;XA)
A phase-transition induced by the struggle for life in a competitive coexistence model in ecology, 20:2017 (R;XA)
A superfield generalization of the classical action-at-a-distance theory, 20:2047 (R;XA)
Analytic formulae for the Hartree-Fock order parameter at arbitrary p/q filling factors for the 2DEG in a magnetic field, 20:2362 (R;XA)
Annihilation diagrams in two-body nonleptonic decays of charmed mesons, 20:2157 (R;XA)

Atmospheric turbidity and the diffuse irradiance in Lagos, Nigeria, 20:1747 (R;XA)
Behaviour at $X=\pm\infty$ of solutions to a predator-prey model, 20:2011 (R;XA)
Behaviour of the reaction front for $A + B \rightarrow C$ diffusion-reactions systems: An analytic approach, 20:2012 (R;XA)
Boundary dynamics in dilaton gravity, 20:2043 (R;XA)
Central extension of a new W_∞-type algebra, 20:2050 (R;XA)
Coherent state path-integral representation of supersymmetric lattice models, 20:2365 (R;XA)
Condensate localization by mesoscale disorder in high-T_c superconductors, 20:2364 (R;XA)
Construction of a nitrogen laser for plasma diagnostics, 20:2412 (R;XA)
Correlated density matrix theory of spatially inhomogeneous Bose fluids, 20:2388 (R;XA)
Critical parameters of Quark-Hadron phase transition with interacting and massive quarks, 20:2085 (R;XA)
Describing the macroscopic world: Closing the circle within the dynamical reduction program, 20:1978 (R;XA)
Dissipative quantum mechanics: The generalization of the canonical quantization and von Neumann equation, 20:1989 (R;XA)
Domain growth in weakly disordered magnets: A coupled map lattice approach, 20:2300 (R;XA)
Dynamic Jahn-Teller-induced infrared absorption of a charged C^-_{60} molecule, 20:2297 (R;XA)
Dynamics of phase ordering of nematics in a pore, 20:2299 (R;XA)
Equivariant Kaehler geometry and localization in the G/G model, 20:2036 (R;XA)
Estimation and analysis of spectral solar radiation over Cairo, 20:640 (R;XA)
Evolution of Spark plasma using nitrogen laser shadowgraphy system, 20:2410 (R;XA)
Far-infrared and submillimeter spectroscopy of photodissociation regions, 20:2282 (R;XA)
Flare stars and Pascal distribution, 20:2013 (R;XA)
Geometric gauge fields in semiclassical gravity, 20:2042 (R;XA)
Heavy quark effective theory, interpolating fields and Bethe-Salpeter amplitudes, 20:2084 (R;XA)
Homogeneous anisotropic cosmological models in the minimum quadratic Poincare gauge theory of gravity, 20:2046 (R;XA)
HyperKaehler metrics building and integrable models, 20:2040 (R;XA)
Involutive co-distributions preserved by transitive families of vector fields, 20:2041 (R;XA)
Masses of heavy fermions and Higgs boson in four-generation fermion condensate scheme, 20:2089 (R;XA)
Model independent QED corrections to the process $ep \rightarrow eX$, 20:2158 (R;XA)
Modelling the day to day wind variability offshore central Chile at about 30 deg. south, 20:718 (R;XA)
Monte Carlo study of electron-plasmon scattering effects on hot electron transport in GaAs, 20:2343 (R;XA)
Neutrino mass and oscillation angle phenomena within the asymmetric left-right models, 20:2192 (R;XA)
Nonexistence of global solutions to some quasilinear hyperbolic equations with dynamic boundary conditions, 20:1977 (R;XA)
Nonlinearity induced nontrivial dynamics in the Jaynes-Cummings Hamiltonian, 20:1985 (R;XA)
Numerical solution of the optimized random phase approximation, 20:1348 (R;XA)
On connection of q-deformed para oscillators with para oscillators, 20:1988 (R;XA)
On D=2 (1/3, 1/3) supersymmetric theories 1, 20:2038 (R;XA)
On D=2 (1/3,1/3) supersymmetric theories 2, 20:2039 (R;XA)
On exotic supersymmetries of the $\phi_{1,3}$ deformation of minimal models, 20:2052 (R;XA)
On Segal-Wilson's construction for the τ-functions of the constrained KP hierarchies, 20:1980 (R;XA)
On the Cohen-Macaulayness and Gorensteinness of integral closure filtrations Rees algebras of height-two equimultiple ideals, 20:1981 (R;XA)
On the field theory of the extended-type electron, 20:2048 (R;XA)
On the generation of coastal lows in central Chile, 20:1748 (R;XA)
Optical instabilities and chaos due to the virtual formation of biexcitons, 20:2301 (R;XA)
Photoionization of shallow donor impurities in finite-barrier quantum wells, 20:2283 (R;XA)
Physico-chemical and mineralogical properties influencing water-stability of aggregates of some Italian surface soils, 20:1797 (R;XA)
Predicting the components of the total hemispherical solar radiation from sunshine duration measurements in Lagos, Nigeria, 20:641 (R;XA)
Quantum group random walks in strongly correlated 2+1 D spin systems, 20:2390 (R;XA)
Quantum mechanical analogy for solving a competitive coexistence model in ecology, 20:2016 (R;XA)
Quantum symplectic geometry. 1. The matrix Hamiltonian formalism, 20:1990 (R;XA)
Radiative corrections for pion polarizability experiments, 20:2160 (R;XA)
Recoil effects in quantum topological solitons, 20:1987 (R;XA)
Regge in the sky: Origin of the cosmic rotation, 20:1982 (R;XA)
Relevance of induced gauge interactions in decoherence, 20:2045 (R;XA)
Rotational melting in displacive quantum paraelectrics, 20:2361 (R;XA)
Scalar three body decays and signals for new physics, 20:2159 (R;XA)
Self-focusing of electromagnetic radiation in electron-positron ion plasma, 20:2409 (R;XA)
Semiglobal Alice strings, 20:2044 (R;XA)
Solitons in electron-positron plasma, 20:2411 (R;XA)
String-loop corrections to effective action and black-hole instabilities, 20:2049 (R;XA)
Strong phase correlations of solitons of nonlinear Schroedinger equation, 20:1983 (R;XA)
Structural and thermodynamic properties of 3-d transition metals: Pseudopotential theory revisited, 20:1347 (R;XA)
Symbolic dynamics of the Lorenz equations, 20:2015 (R;XA)
Tachyon condensates and anisotropic universe, 20:2037 (R;XA)
Temperature bounds in a model of laminar flames, 20:2010 (R;XA)
Testing quantum behaviour at the macroscopic level, 20:1986 (R;XA)
The λ-bar exponent for conservative systems, 20:2298 (R;XA)
The criteria for the Cohen-Macaulayness and Gorensteiness of Rees algebras of ideals having positive analytic deviation, 20:1984 (R;XA)
The geodesic motion in Kaluza-Klein spinning space, 20:2035 (R;XA)
The surface of liquid ^{4}He at nonzero temperatures, 20:2389 (R;XA)
The twist-3 single spin asymmetries of pion production, 20:2087 (R;XA)
The use of empirical models to investigate GPS derived total electron content, 20:2014 (R;XA)
Two dimensional simplicial paths, 20:2051 (R;XA)
Valencia 93: The summary of particle theory, 20:2086 (R;XA)
Zero sound velocity in π, ρ mesons at different temperatures, 20:2088 (R;XA)

International Technology Corp., Albuquerque, NM (United States)
Use of engineered soils and other site modifications for low-level radioactive waste disposal, 20:1786 (R;US)

Interstate Oil Compact Commission, Oklahoma City, OK (United States)
An evaluation of known remaining oil resources in the United States: Appendix, Project on Advanced Oil Recovery and the States, 20:106 (R;US)
An evaluation of known remaining oil resources in the United States: Project on advanced oil recovery and the states: Volume 1, 20:107 (R;US)
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)
An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)

An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)

Iowa State Coll., Ames, IA (United States). Dept. of Physics
Neutron diffraction study of the magnetic ordering of $BaCuO_{2+x}$, 20:1174 (R;US)

Iowa State Univ. of Science and Technology, Ames, IA (United States)
Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes, 20:1370 (R;US)
Development of novel separation techniques for biological samples in capillary electrophoresis, 20:1865 (R;US)
Directional solidification of the alumina-zirconia ceramic eutectic system, 20:1233 (R;US)
Magnetic field dependence of the correlation gap in SmB_6, 20:1232 (R;US)
Novel absorption detection techniques for capillary electrophoresis, 20:1327 (R;US)
Selenophene transition metal complexes, 20:1364 (R;US)
Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)
Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal, 20:2384 (R;US)

J

Jacobs Engineering Group, Inc., Albuquerque, NM (United States)
Baseline risk assessment of ground water contamination at the inactive uraniferous lignite ashing site near Belfield, North Dakota, 20:488 (R;US)
Baseline risk assessment of ground water contamination at the Monument Valley Uranium Mill Tailings Site, Cane Valley, Arizona: Revision 1, 20:228 (R;US)
Response to the independent technical review of the UMTRA Project procedures and practices for well drilling and development, 20:487 (R;US)
UMTRA Project water sampling and analysis plan, Belfield and Bowman, North Dakota, 20:489 (R;US)
Work plan for ground water elevation data recorder/monitor well injection at Grand Junction, Colorado, 20:490 (R;US)
Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado, 20:491 (R;US)
Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado: Revision 1, 20:492 (R;US)

Jacobs Engineering Group, Inc., Pasadena, CA (United States)
Analysis of population and workers exposure in the context of decommissioning of Wismut uranium mining operations and clean up of wastes, 20:486 (RA;US)
Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness, 20:912 (RA;US)
Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Economics, funding and the influence of politics on the Wismut Program, 20:907 (RA;US)
Economics, funding and the influence of politics on the UMTRA Project, 20:908 (RA;US)
Groundwater remediation at UMTRA Sites, 20:485 (RA;US)
Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)
History of US uranium mining and milling, 20:940 (RA;US)
Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey, 20:1910 (RA;US)
Quality assurance, documentation, and long-term monitoring, 20:484 (RA;US)
Tailings remediation at UMTRA Project Sites: Engineering practices, 20:482 (RA;US)
The UMTRA Project process and framework for execution, 20:481 (RA;US)
The Uranium Mill Tailings Radiation Control Act and its implementation from a regulatory perspective, 20:483 (RA;US)
The Uranium Mill Tailings Remedial Action Project, 20:479 (RA;US)
The US DOE Environmental Restoration Program – a Washington perspective, 20:976 (RA;US)
Uranium deposits and production in Eastern Europe and the former Soviet Union, 20:142 (RA;US)

Japan Atomic Energy Research Inst., Tokyo (Japan)
Analysis of reactor power oscillation based on nonlinear dynamic theory, 20:749 (R;JP;In Japanese)
Behavior of pre-irradiated fuel under a simulated RIA condition: Results of NSRR test JM-3, 20:817 (R;JP)
Benchmark experiment on a copper slab assembly bombarded by D-T neutrons, 20:2439 (R;JP)
Collective flow and particle production in high energy heavy ion collisions, 20:2253 (RA;JP;In Japanese)
Development of a rapid gelation apparatus with microwave heating, 20:818 (R;JP;In Japanese)
Development of irradiation capsule for nuclear research reactor using aromatic polyether (BEK), 20:862 (R;JP;In Japanese)
Improvement of pressure drop calculation model in TRAC-PF1 code, 20:765 (R;JP;In Japanese)
Initial tank calibration at NUCEF critical facility. 2: Data analysis, 20:1439 (R;JP;In Japanese)
Mass model for unstable nuclei, 20:2219 (RA;JP)
Neutron measurement for the reactions induced by high-energy protons, 20:2255 (RA;JP)
Pauli blocking and internucleus potential effects on total reaction cross section, 20:2256 (RA;JP;In Japanese)
Proceedings of the 19th linear accelerator meeting in Japan, 20:1512 (R;JP;In Japanese, English)
QMD calculation of nucleon-nucleus reaction cross sections, 20:2257 (RA;JP)
Relativistic mean field theory for unstable nuclei and its applications, 20:2055 (RA;JP;In Japanese)
Status of intermediate energy nuclear data, 20:2254 (RA;JP)
Two-nucleon and meson-two-nucleon systems at intermediate energies, 20:2167 (RA;JP)

Japan Atomic Industrial Forum, Inc., Tokyo (Japan)
Application of X-ray radiography to archaeology, 20:581 (IA;JP;In Japanese)
Application to plutonium and uranium in safeguards, 20:554 (IA;JP;In Japanese)
Aspect of human food ecology: Development of carbon and nitrogen isotope method, 20:1303 (IA;JP;In Japanese)
BEAM applications to polymer materials, 20:1378 (IA;JP;In Japanese)
Detection of irradiation treatment of foods, 20:1898 (IA;JP;In Japanese)
Development of radiation utilization for economic growth in China, 20:2511 (IA;JP)
Experiences in selling irradiated produce at the retail level, 20:1896 (IA;JP)
Food irradiation in China: With emphasis on market testing and public acceptance, 20:1897 (IA;JP)
Highlights of IAEA activities in the field of radiation application, 20:2510 (IA;JP)
Ion beam technology for nanostructure and interface engineering, 20:2348 (IA;JP;In Japanese)
Isotopic approach to the provenance study of artifacts, 20:1302 (IA;JP;In Japanese)
Measurement technique of radwaste content: For TRU, 20:555 (IA;JP;In Japanese)
Neutron therapy and medical therapy reactor, 20:1879 (IA;JP;In Japanese)
New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry, 20:1304 (IA;JP;In Japanese)
Perspectives of ion beam utilization on plant gene analysis, 20:1917 (IA;JP;In Japanese)
Present status of radiation utilization in Thailand, 20:2512 (IA;JP)
Production and supply of radioisotopes with high-energy particle accelerators current status and future directions, 20:580 (IA;JP)

Sub-half-micrometer device fabrication with synchrotron based X-ray lithography, 20:2314 (IA;JP;In Japanese)
Today and tomorrow of intravenous coronary angiography programme in Japan, 20:1878 (IA;JP)

Japan Radioisotope Association, Tokyo (Japan)
Application of X-ray radiography to archaeology, 20:581 (IA;JP;In Japanese)
Application to plutonium and uranium in safeguards, 20:554 (IA;JP;In Japanese)
Aspect of human food ecology: Development of carbon and nitrogen isotope method, 20:1303 (IA;JP;In Japanese)
BEAM applications to polymer materials, 20:1378 (IA;JP;In Japanese)
Detection of irradiation treatment of foods, 20:1898 (IA;JP;In Japanese)
Development of radiation utilization for economic growth in China, 20:2511 (IA;JP)
Experiences in selling irradiated produce at the retail level, 20:1896 (IA;JP)
Food irradiation in China: With emphasis on market testing and public acceptance, 20:1897 (IA;JP)
Highlights of IAEA activities in the field of radiation application, 20:2510 (IA;JP)
Ion beam technology for nanostructure and interface engineering, 20:2348 (IA;JP;In Japanese)
Isotopic approach to the provenance study of artifacts, 20:1302 (IA;JP;In Japanese)
Measurement technique of radwaste content: For TRU, 20:555 (IA;JP;In Japanese)
Neutron therapy and medical therapy reactor, 20:1879 (IA;JP;In Japanese)
New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry, 20:1304 (IA;JP;In Japanese)
Perspectives of ion beam utilization on plant gene analysis, 20:1917 (IA;JP;In Japanese)
Present status of radiation utilization in Thailand, 20:2512 (IA;JP)
Production and supply of radioisotopes with high-energy particle accelerators current status and future directions, 20:580 (IA;JP)
Sub-half-micrometer device fabrication with synchrotron based X-ray lithography, 20:2314 (IA;JP;In Japanese)
Today and tomorrow of intravenous coronary angiography programme in Japan, 20:1878 (IA;JP)

Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Computing Techniques and Automation
Do fragment multiplicity distributions obey any kind of scaling ?, 20:2232 (R;XJ)
Dynamics of nonadiabatic charged particles in the magnetic dipole field with imposed homogeneous magnetic field, 20:2545 (R;XJ;In Russian)
On a new type of long-range forces, 20:2056 (R;XJ)
On the numerical method for analysis of the dynamics of the classical Hamiltonian systems, 20:2543 (R;XJ)
Regge theory inspired model on nuclear destruction in high energy nucleus-nucleus interactions, 20:2231 (R;XJ)
The use of DBMS and document oriented interface in the TPLAN-system, 20:2544 (R;XJ)

Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of High Energy
Incompatibility of the generally accepted definition of a moving scale length with interval Lorentz invariance, 20:1975 (R;XJ)
Measurements of T_{20} in backward elastic d p scattering at deuteron momenta 3.5 - 6 GeV/c, 20:2260 (R;XJ)
New data on T_{20} in inclusive deuteron breakup at 9 GeV/c on protons and correlation between polarization observables, 20:2259 (R;XJ)
Polarization phenomena in deuteron-proton backward elastic scattering, d + p -> p + d, 20:2258 (R;XJ)
The properties of nucleon clusters production in (p, d) + Ta and (p, d) + C interactions over energy range from 4.2 to 10 GeV/c per nucleon, 20:2263 (R;XJ;In Russian)

Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Neutron Physics
Communication VME-KK009 interface to control CAMAC equipment, 20:1641 (R;XJ;In Russian)
Existence domains and some properties of a particle bound state in fields with homogeneous dependence of its potential energy on coordinates, 20:2059 (R;XJ;In Russian)

Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Problems
Astatination of monoclonal antibodies, 20:1889 (R;XJ;In Russian)
Medical facility for radiation therapy with JINR proton phasotron beams, 20:1888 (R;XJ)
On fractal structure of quantum gravity and relic radiation anisotropy, 20:2057 (R;XJ)
Separated muon beams in the low-background laboratory of the JINR phasotron for studies involving the μSR-method, 20:1555 (R;XJ;In Russian)
The track system of the modernized 'Hyperon' spectrometer, 20:1642 (R;XJ;In Russian)
Vacuum polarization effects in low-energy muonic atom collisions, 20:2289 (R;XJ)

Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Nuclear Reactions
New statistical function for the angular distribution of evaporation residues produced by heavy ions, 20:2262 (R;XJ)
The investigation of the cross sections of Po isotopes formation in the ^{27} Al + ^{175} Lu and ^{31} P + ^{169} Tm reactions, 20:2265 (R;XJ;In Russian)

Joint Inst. for Nuclear Research, Dubna (Russian Federation). Lab. of Theoretical Physics
(γ, n) cross section in heavy nuclei in the region of the giant quadrupole resonance, 20:2264 (R;XJ;In Russian)
Conserved currents for ed-e' N N, ed-e'd' and γd - N N reactions in the framework of three-dimensional field theoretical formulation, 20:2261 (R;XJ)
Constraints, complex structures and quantization, 20:1999 (R;XJ)
Ellipsoidal basis for isotropic oscillator, 20:2000 (R;XJ)
Exact solution of 2 D Poincare gravity coupled with fermion matter, 20:2097 (R;XJ)
Excited states of mesons within the NJL model with the homogeneous vacuum gluon field, 20:2096 (R;XJ)
Inelastic collisions of negative muons and hadrons with metastable hydrogen atoms, 20:2290 (R;XJ;In Russian)
Inelastic collisions of negative muons and hadrons with Helium metastable atoms, 20:2291 (R;XJ;In Russian)
Mass splitting of the pseudoscalar and vector mesons induced by the homogeneous vacuum gluon field, 20:2095 (R;XJ)
On a possible explanation of the origin of the quark mass spectrum, 20:2098 (R;XJ)
One-phonon excitations in hot nuclei, 20:2220 (R;XJ;In Russian)
Quantization of a Hamiltonian system with an infinite number of degrees of freedom, 20:2058 (R;XJ)
Wormhole on the Lobachevsky background, 20:1976 (R;XJ)

K

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A model technology transfer program for independent operators: Kansas Technology Transfer Model (KTTM), 20:112 (R;US)

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Reliability analysis of complex components using the stochastic finite element method, 20:733 (R;DE;In German)

Karlsruhe Univ. (T.H.) (Germany). Fakultaet fuer Wirtschaftswissenschaften
Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions, 20:53 (R;DE;In German)

Kellogg (M.W.) Co., Houston, TX (United States)
Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)

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The development of an integrated multistage fluid-bed retorting process: Quarterly report, April–June, 1994, 20:140 (R;US)

Kernforschungszentrum Karlsruhe GmbH (Germany)
ALBIOS: an analysis of aluminium biogeochemistry in forested watersheds of North America and Northern Europe, 20:1951 (IA;DE)
Application of surface analysis methods to studies of atmospheric deposition in forests, 20:1759 (IA;DE)
Case studies and general patterns of ion budgets in North American forests, 20:1816 (IA;DE)
Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)
Conservation and reconstruction of forests in the medium-range mountains of the German Democratic Republic under the impact of nuisances, 20:1815 (IA;DE;In German)
Critical loads for deposition of acid and nitrogen - do we know enough to make the concept useful?, 20:1813 (IA;DE)
Early biochemical effects of air pollutants: detection and possible significance for forest trees, 20:1964 (IA;DE)
Effect of acid deposition on soil animals and microorganisms: influence on structures and processes, 20:1959 (IA;DE)
Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)
Exclusion experiment for gaseous pollutants in spruces at Edelmannshof: concept and first element-budget data, 20:1810 (IA;DE;In German)
Forest damage and incremental growth, 20:1955 (IA;DE;In German)
Forest damage research programme. Research on atmospheric pollutant deposition in American forests, 20:1818 (IA;DE;In German)
Forest decline in ecosystem perspective, 20:1953 (IA;DE)
Forest decline in the Southern Appalachian Mountains. Research and observations: 1983-1989, 20:1817 (IA;DE)
Forest decline research in Northrhine-Westphalia at the regional research site Eggegebirge/Velmerstot, 20:1809 (IA;DE;In German)
Importance of the genetic structure in tree species for forest ecosystems under the influence of air pollutants, 20:1962 (IA;DE)
Input-output balances of acids, heavy metals and nutrients, and compartments of accumulation and depletion in forest ecosystems, 20:1812 (IA;DE)
International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings, 20:1950 (I;DE;In German, English)
International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings, 20:1952 (I;DE;In German, English)
Microscopical aspects of foliar alterations in declining trees, 20:1960 (IA;DE)
Modelling nutrition and growth in pollution research, 20:1966 (IA;DE)
Morphological changes in the crowns of European beech (Fagus sylvatica L.) and other deciduous tree species, 20:1956 (IA;DE)
Natural and anthropogenic stress in spruce and beech ecosystems in the Solling project, 20:1808 (IA;DE)
On the research program forest decline at the site 'Postturm', forest district Farchau/Ratzeburg, 20:1807 (IA;DE;In German)
Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge, 20:1965 (IA;DE)
Possibilities and limits of fertilization and melioration liming (as measures to fight 'novel' forest disease), 20:1814 (IA;DE;In German)
Rates of wet, moist and dry deposition in forests: measuring approaches and measuring results, 20:1758 (IA;DE;In German)
Reaction and interaction of mycorrhizae and rhizosphere, 20:1958 (IA;DE)
Reactions of tree species to air pollutants under controlled conditions, 20:1961 (IA;DE;In German)
Soil acidification: its extent, development during the last decades, and causes, 20:1820 (IA;DE;In German)
State of the discussion on standard values for atmospheric pollutant concentrations, 20:1819 (IA;DE;In German)
Temporal development of the pollution load of reactive trace gases in forested areas in the United States, 20:1757 (IA;DE)
The effects of acid irrigation and compensation liming on soil and trees in a mature Norway spruce stand (Hoeglwald project), 20:1811 (IA;DE)
The response of leaves to potentially acidic gases, 20:1963 (IA;DE)
Trends in, and current state of, forest damage surveying, 20:1954 (IA;DE;In German)

Kernforschungszentrum Karlsruhe GmbH (Germany). Abt. fuer Angewandte Systemanalyse
Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions, 20:53 (R;DE;In German)

Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Materialforschung
An austenitic steel for fuel cladding tubes and core components of LMFBR's with high ductility after neutron irradiation, 20:1152 (R;DE;In German)
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and Inconel-718 at high temperatures, 20:1150 (R;DE)
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and stainless steel at high temperatures, 20:1151 (R;DE)
Discussion of plastic instabilities of a pressure vessel by means of the finite element method, 20:809 (R;DE;In German)
Reliability analysis of complex components using the stochastic finite element method, 20:733 (R;DE;In German)

Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Meteorologie und Klimaforschung
Karlsruhe Nuclear Research Center, Institute for Meteorology and Climate Research. Progress report on research and development work in 1993, 20:1761 (R;DE;In German)

Kernforschungszentrum Karlsruhe GmbH (Germany). Inst. fuer Nukleare Entsorgungstechnik
Electrochemical corrosion studies on a selected carbon steel for application in nuclear waste disposal containers: Influence of radiolytic products on corrosion in brines, 20:1153 (R;DE)

Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Europaeisches Forschungszentrum fuer Massnahmen zur Luftreinhaltung (PEF)
Improvement of a wet process for the separation of aerosols, 20:1762 (R;DE;In German)

Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Nukleare Sicherheitsforschung
An austenitic steel for fuel cladding tubes and core components of LMFBR's with high ductility after neutron irradiation, 20:1152 (R;DE;In German)
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and Inconel-718 at high temperatures, 20:1150 (R;DE)
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and stainless steel at high temperatures, 20:1151 (R;DE)

Kernforschungszentrum Karlsruhe GmbH (Germany). Projekt Wasser-Abfall-Boden (PWAB)
Formation and degradation mechanisms of polychlorodibenzodioxins, polychlorodibenzofurans and other organic pollutants produced in waste incineration processes: Final report, 20:1346 (I;DE;In German)

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Scale-up of mild gasification to a process development unit: Quarterly report, February–May, 1994, 20:11 (R;US)

Koeln Univ. (Germany)
Studies on a modular high-energy photon spectrometer of pure CsI scintillators, 20:1644 (R;DE;In German)

Krupp-VDM AG, Werdohl (Germany)
Development of a relational database for rated values of metallic materials: Final report, 20:2570 (I;DE;In German)

L

Laboratoire National Saturne, Centre d'Etudes de Saclay, 91 - Gif-sur-Yvette (France)

Dimensions resulting from $\delta\Phi_s.\delta(\Delta E)_L$ defects, 20:1518 (R;FR;In French)

Final energy dependence on phase fluctuations $\delta\Phi_s$ and on the level of $(\Delta E)_L$, 20:1519 (R;FR;In French)

Landesanstalt fuer Pflanzenbau Forchheim, Rheinstetten (Germany)

Results of the Baden-Wuerttemberg cultivation experiments with sunflowers, soybeans and flax plants, 1992, 20:619 (I;DE;In German)

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Windows of wood, plastic or aluminium: Material and design requirements, advice for tender, construction management and takeover, 20:1018 (I;DE;In German)

Lawrence Berkeley Lab., CA (United States)

A 2.5 MeV electrostatic quadrupole dc accelerator for BNCT application, 20:1890 (R;US)

A multiple objective magnet sorting algorithm for the ALS insertion devices, 20:1604 (R;US)

A new method for predicting the solar heat gain of complex fenestration systems: II, Detailed description of the matrix layer calculation, 20:1022 (R;US)

A storage ring for radioactive beams, 20:1606 (R;US)

Advanced Light Source elliptical wiggler, 20:1605 (R;US)

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ALS Multiple Trim Magnets, or "Magic Fingers," for insertion device field integral correction, 20:1591 (R;US)

Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)

Broad-band, multi-kilowatt, vacuum, HOM waveguide loads for the PEP-II RF cavity, 20:1613 (R;US)

Building Technologies Program, 1993 annual report, 20:1025 (R;US)

Characterization of inactive carbon in GaAs, 20:1284 (R;US)

Chemical sciences, annual report 1993, 20:1365 (R;US)

Correlated wavefunction Monte Carlo studies of excitations in the quantum Hall liquids, 20:2397 (R;US)

Dilepton production from p-p to Ca-Ca at the Bevalac, 20:2178 (R;US)

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Exclusive study of nuclear collisions at the AGS, 20:2272 (R;US)

Exploratory Technology Research Program for electrochemical energy storage: Executive summary report for 1993, 20:896 (R;US)

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Flow and multifragmentation in nuclear collisions at intermediate energies, 20:2271 (R;US)

Heavy residues from very mass asymmetric heavy ion reactions, 20:2268 (R;US)

High-power RF window design for the PEP-II B Factory, 20:1614 (R;US)

Indoor Environment Program, 1993 annual report, 20:1024 (R;US)

Induction linacs for heavy ion fusion, 20:2445 (R;US)

Laser trapping of ^{21}Na atoms, 20:2007 (R;US)

Lawrence Berkeley Laboratory 1993 Site Environmental Report, 20:921 (R;US)

Multipole contribution from an off-axis orbit in an IR quadrupole and the consequences on the dynamic aperture, 20:1609 (R;US)

Nickel hydroxide electrodes in reduced-alkalinity electrolytes, 20:898 (R;US)

Operation and performance of a longitudinal damping system using parallel digital signal processing, 20:1612 (R;US)

Optimizing the effective conductivity and cost of gas-filled panel thermal insulations, 20:1026 (R;US)

Photoluminescence under pressure and annealing of nitrogen-doped ZnSe, 20:1283 (R;US)

Properties of strange-matter stars, 20:2025 (R;US)

Residential appliance data, assumptions and methodology for end-use forecasting with EPRI-REEPS 2.1, 20:990 (R;US)

Resonant generation of nonequilibrium phonons in GaAs/AlAs quantum wells via intersubband scattering, 20:2306 (R;US)

RF system design for the PEP-II B Factory, 20:1610 (R;US)

Stopping and two-pion Bose-Einstein correlation results from CERN experiment NA35, 20:2270 (R;US)

Strange particle and antiproton production in S + nucleus collisions at 200 GeV/nucleon, 20:2269 (R;US)

Study of small carbon and semiconductor clusters using negative ion threshold photodetachment spectroscopy, 20:2296 (R;US)

Technology data characterizing lighting in commercial buildings: Application to end-use forecasting with commend 4.0, 20:991 (R;US)

Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0, 20:1020 (R;US)

The design and evaluation of three advanced daylighting systems: Light shelves, light pipes and skylights, 20:1021 (R;US)

The potential for reducing urban air temperatures and energy consumption through vegetative cooling, 20:992 (R;US)

The principle of phase stability and the accelerator program at Berkeley, 1945–1954, 20:1523 (R;US)

Transportation energy use in Mexico, 20:1032 (R;US)

Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas, 20:1495 (R;US)

Undulators at the ALS, 20:1590 (R;US)

Wavelength and power stability measurements of the Stanford SCA/FEL, 20:1524 (R;US)

Lawrence Livermore National Lab., CA (United States)

A large block heater test for high level nuclear waste management, 20:322 (R;US)

A mixed time integration method for large scale acoustic fluid-structure interaction, 20:1452 (R;US)

Advanced pyrochemical technologies for minimizing nuclear waste, 20:321 (R;US)

An image cancellation approach to depth-from-focus, 20:2562 (R;US)

Computational model of drilling with high radiance pulsed lasers, 20:1451 (R;US)

Computer programs for analysis of geophysical data, 20:1973 (R;US)

CTBT technical issues handbook, 20:1099 (R;US)

Director's series on proliferation, 20:1098 (R;US)

Effects of tropospheric aerosols on radiative flux calculations at UV and visible wavelengths, 20:1770 (R;US)

Ergonomic evaluation of the Apple Adjustable Keyboard, 20:2564 (R;US)

Evaluation of thermo-hydrological performance in support of the thermal loading systems study, 20:320 (R;US)

Fiber-optic sensors for rapid, inexpensive characterization of soil and ground water contamination, 20:1839 (R;US)

Generation and solution of effective many-body Hamiltonians for rare earth and transition metal compounds, 20:2387 (R;US)

High speed optical links between LLNL and Berkeley, 20:2565 (R;US)

Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)

Lawrence Livermore National Laboratory safeguards and security quarterly progress report to the U.S. Department of Energy: Quarter ending June 30, 1994, 20:562 (R;US)

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LLNL/Lion Precision LVDT amplifier, 20:1511 (R;US)

Magnetic x-ray circular dichroism in spin-polarized photoelectron diffraction, 20:2342 (R;US)

Meso-scale cooling effects of high albedo surfaces: Analysis of meteorological data from White Sands National Monument and White Sands Missile Range, 20:1822 (R;US)

Microearthquake monitoring and seismic imaging at The Geysers, 20:713 (R;US)

Model-based inversion for a shallow ocean application, 20:1974 (R;US)

Model-based ocean acoustic passive localization: Revision 1, 20:1675 (R;US)

MTX final report, 20:2427 (R;US)

Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Observation of strong emission from NeIX and NeX transitions in a laser-driven plasma, 20:1510 (R;US)
Pollution prevention: Avoiding the need to manage wastes, 20:1053 (R;US)
Predicting the pressure driven flow of gases through microcapillaries and micro-orifices, 20:1442 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 1, 20:1690 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 2, 20:1691 (R;US)
Quantitative evaluation of wrist posture and typing performance: A comparative study of 4 computer keyboards, 20:2563 (R;US)
Radiation-driven targets for heavy-ion fusion, 20:2447 (R;US)
Sputter deposition of multilayer thermoelectric films: An approach to the fabrication of two-dimensional quantum wells, 20:1004 (R;US)
The National Storage Laboratory: Overview and status, 20:2560 (R;US)
The new nuclear microprobe at Livermore, 20:1336 (R;US)
Validation of an in vitro test method to evaluate materials against liquid HD, 20:1700 (R;US)
Visualizing 3D velocity fields near contour surfaces: Revision 1, 20:2561 (R;US)

Lehigh Univ., Bethlehem, PA (United States)
Robotic weld overlay coatings for erosion control, 20:90 (R;US)

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A new method to extract gas concentrations in the ultraviolet and visible wavelength ranges, based on differential optical absorption technique and Fourier transform, 20:1652 (R;SE)

Los Alamos National Lab., NM (United States)
A cryogenic dose calorimeter for pulsed radiographic accelerators, 20:1651 (R;US)
A survey of artificial neural network applications in flow analysis of energy networks, 20:2546 (R;US)
Accurate solution algorithms for incompressible multiphase flows, 20:1476 (R;US)
An investigation of the chemical and physical properties of pristine, electrochromically damaged, and photochromically damaged $KTiOPO_4$ (KTP) using surface analytical and optical spectroscopic techniques, 20:1503 (R;US)
Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring, 20:289 (R;US)
Base hydrolysis and hydrothermal processing of PBX-9404, 20:291 (R;US)
Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993, 20:2221 (R;US)
Characteristics of prototype TOPAZ-II fuel, 20:791 (R;US)
Characterization of high-explosive initiation and safety at Los Alamos, 20:1687 (R;US)
Conceptual design of an RTG Facility Transportation System, 20:1002 (R;US)
Confirmatory experiments for the United States Department of Energy Accelerator Production of Tritium Program: Neutron, triton and radionuclide production by thick targets of lead and tungsten bombarded by 800 MeV protons, 20:1587 (R;US)
Continuously-tunable, narrow-linewidth, Q-switched Cr:LiSAF laser for lidar applications, 20:1765 (R;US)
Determining information management needs for enhanced international safeguards, 20:558 (R;US)
Development of methods for evaluating options for improving the air quality in Santiago, Chile and its environs, 20:1766 (R;US)
Directed light fabrication, 20:1155 (R;US)
Effects of plasma physics on capsule implosions in gas-filled hohlraums, 20:2441 (R;US)
Electrical-conductivity testing of latex gloves, 20:1487 (R;US)
Evaluation of no-clean solder process designed to eliminate the use of ozone-depleting chemicals, 20:1763 (R;US)
Final report for design and development SAWAFE peak detector chip, 20:1502 (R;US)
Fractal nature and scaling of normal faults, Rio Grande rift, NM: Implications for growth and strain, 20:1972 (R;US)
Fusion power production in TFTR, 20:2444 (R;US)
Future directions for arms control and nonproliferation: Conference summary, 20:1097 (R;US)
Heating and transport in TFTR D-T plasmas, 20:2417 (R;US)
High-level assessment of LANL ABC Design, 20:788 (R;US)
In-place testing summary (1992): Progress report, 20:286 (R;US)
In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory, 20:1237 (R;US)
Inhibition of mitotic-specific histone phophorylation by sodium arsenite, 20:1967 (R;US)
Integrated null-flux suspension and multiphase propulsion system for magnetically-levitated vehicles, 20:1080 (PA;US)
Large eddy simultations of the atmospheric boundary layer east of the Colorado Rockies, 20:1764 (R;US)
LISK-BROOM: Clearing near-Earth space debris in 4 years using a 20-kW, 530-nm repetitively pulsed laser, 20:1441 (R;US)
Low density gas and foam targets for ICF long scale length plasma experiments: Fabrication & characterization, 20:2442 (R;US)
Low-level RF LabVIEW® control software user's manual: Version 1.0, 20:1586 (R;US)
Magnetic separation for environmental remediation, 20:503 (R;US)
Moment approach to high-order accelerator beam optics, 20:1539 (R;US)
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Multi-basin dynamics of a protein in aqueous solution, 20:1867 (R;US)
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)
NESTLE: Few-group neutron diffusion equation solver utilizing the nodal expansion method for eigenvalue, adjoint, fixed-source steady-state and transient problems, 20:801 (R;US)
New technique for determining boundary dose from the Los Alamos Meson Physics Facility, 20:1767 (R;US)
New thermal neutron scattering files for ENDF/B-VI release 2, 20:2266 (R;US)
Noninterceptive transverse emittance measurement diagnostic for an 800 MeV H^- transport line, 20:1589 (R;US)
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)
On the Taylor test, Part 3: A continuum mechanics code analysis of steady plastic wave propagation, 20:1154 (R;US)
Outline of an on-site inspection regime for conventional arms control in Europe, 20:1679 (R;US)
Oxidation behavior of aluminum nanopowders, 20:1157 (R;US)
Parity nonconservation in radioactive atoms: An experimental perspective, 20:2295 (R;US)
Potential-of-mean-force description of ionic interactions and structural hydration in biomolecular systems, 20:1868 (R;US)
Preconceptual engineering design for the APT ^{3}He Target/Blanket concept, 20:1693 (R;US)
Preformed transient gas channels for laser wakefield particle acceleration, 20:1522 (R;US)
Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico, 20:459 (R;US)
Proceedings of the Workshop on Simulating Accelerator Radiation Environments, 20:1521 (R;US)
Production of high specific activity silicon-32, 20:1419 (PA;US)
Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)
Prototype integration of the joint munitions assessment and planning model with the OSD threat methodology, 20:1678 (R;US)
Quantum diffusion, 20:2001 (R;US)
Radionuclide release rates from spent fuel for performance assessment modeling, 20:1856 (R;US)
Re-engineering facilities management at Los Alamos: Managing the behavioral change, 20:2516 (R;US)
Reduction of nitrate and nitrite salts under hydrothermal conditions, 20:290 (R;US)

Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)
Review of recent D-T experiments from TFTR, 20:2443 (R;US)
Safeguards and Security Research and Development progress report, October 1992–September 1993, 20:557 (R;US)
Safety approach and engineered safety systems for the APT ^{3}He Target/Blanket System, 20:1694 (R;US)
Simulation and steering in the intertank matching section of the ground test accelerator, 20:1588 (R;US)
Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures, 20:288 (R;US)
Solution structure analysis of the conformational changes that occur upon the binding of the protein kinase inhibitor peptide to the catalytic subunit of the cAMP dependent protein kinase, 20:1869 (R;US)
Specific activities and DOE-STD-1027-92 hazard Category 2 thresholds, LANL fact sheet, 20:502 (R;US)
Status of CFDLIB performance tests on the T3D, 20:1475 (R;US)
Strain measurement by diffraction at LANSCE, 20:1330 (R;US)
Subsurface fracture mapping using microearthquakes detected during primary oil production, Clinton County, Kentucky, 20:122 (R;US)
Summary of evaporative cooling system for the SSC silicon tracker, 20:1649 (R;US)
Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)
Supertrack Monte Carlo variance reduction experience for non-Boltzmann tallies, 20:1650 (R;US)
The FRAM code: Description and some comparisons with MGA, 20:1331 (R;US)
Tribology and surface mechanical properties of excimer laser nitrided titanium, 20:1158 (R;US)
Tungsten-uranium penetrator target interaction, 20:1156 (R;US)
Utilizing artificial neural networks in netwsork flow analysis: An annotated bibliography, 20:2547 (R;US)
Visible fluorescence of weathered lead, 20:1665 (R;US)

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Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Tank 241-C-103 tank characterization plan, 20:421 (R;US)
Tank characterization reference guide, 20:418 (R;US)
Tank characterization report for double-shell Tank 241-AW-102, 20:394 (R;US)
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Site environmental report: 1993, 20:501 (R;US)

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Nuclear moments of transitional nuclei in the vicinity of Z=40 and Z=82 shells, 20:2222 (R;FR;In French)
Pre-scission light particle emission in the reaction ^{144}Sm (^{32}S, fission) at E_{lab} = 838 MeV: determining of a time scale, 20:2273 (R;FR;In French)

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A micro-strip gas counter test with the RD20 front-end, 20:1653 (R;FR)
Limits on the window for halo phenomena, 20:2002 (R;FR)
Nuclear moments of transitional nuclei in the vicinity of Z=40 and Z=82 shells, 20:2222 (R;FR;In French)
Pre-scission light particle emission in the reaction ^{144}Sm (^{32}S, fission) at E_{lab} = 838 MeV: determining of a time scale, 20:2273 (R;FR;In French)
Single spin asymmetry in inclusive pion production, Collins effect and the string model, 20:2198 (R;FR)
Study of the isospin symmetry breaking in the light quark sea of the nucleon from the Drell-Yan process, 20:2385 (R;FR)
Supersymmetry and Mathematics, 20:2065 (R;FR;In French)

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Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)

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The nitridation of high purity, laser-synthesized silicon powder to form reaction bonded silicon nitride, 20:1170 (R;US)

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The formation of reaction bonded Si_3N_4 at low temperatures and in short times, 20:1171 (R;US)

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Current distribution in Cable-In-Conduit Conductors, 20:2433 (R;US)
Incology alloy 908 data handbook, 20:1110 (R;US)
Joule heating of the ITER TF cold structure: Effects of vertical control coil currents and ELMS, 20:2431 (R;US)
Theory and modelling of quench in cable-in-conduit superconducting magnets, 20:2432 (R;US)
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Causes of decadal climate variability over the North Pacific and North America, 20:1752 (R;DE)
Detecting anthropogenic climate change with an optimal finger-print method, 20:1755 (R;DE)
Interactions of the tropical oceans, 20:1754 (R;DE)
Will greenhouse gas-induced warming over the next 50 years lead to higher frequency and greater intensity of hurricanes?, 20:1753 (R;DE)

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A precision measurement of the branching ratio $\Gamma_{bantib}/\Gamma_{had}$ in the e^+e^- annihilation on the Z^0 resonance, 20:2180 (R;DE;In German)
Measurement of the structure function F_2 of the proton in deep inelastic e-p scattering with the H1 detector at the HERA storage ring, 20:2179 (R;DE;In German)

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Laser Doppler anemometric measurement of two speed components in turbulent channel flow, 20:1470 (I;DE;In German)
Measurement of two velocity components in the vicinity of the wall of a turbulent fluid flow by means of a Laser-Doppler-Anemometer submerged into the fluid, 20:1467 (I;DE;In German)
Non-intrusive measurement of temperature and velocity in free convection, 20:1468 (I;DE;In German)
Thermal convection with phase change: Experimental investigations and comparison with numerical results, 20:1471 (I;DE;In German)

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An EPV view of the zonal mean distribution of temperature and wind in the extra-tropical troposphere, 20:1736 (RA;US)
An observational study of the interaction between the synoptic-scale eddies and the intra-seasonal fluctuations in the atmosphere, 20:1711 (RA;US)
Atlantic interdecadal ocean-atmosphere interaction, 20:1848 (RA;US)
Budgets and balances in a warmer world, 20:1710 (RA;US)
Climatic feedbacks between stationary and transient eddies, 20:1715 (RA;US)
Climatological features of blocking anticyclones, 20:1726 (RA;US)
Diagnosis of balanced and unbalanced motions in a synoptic-scale baroclinic wave life cycle, 20:1716 (RA;US)
Fluctuations in the large-scale atmospheric circulation and ocean conditions associated with the dominant modes of wintertime precipitation variability for the contiguous United States, 20:1730 (RA;US)
Hydrologic and radiative feedbacks on extratropical transient eddies: Implications of global warming, 20:1720 (RA;US)
Interannual variability of north Atlantic Sea surface temperatures, 20:1714 (RA;US)
Intraseasonal oscillations and their predictability in a hemispheric barotropic model with seasonal forcing, 20:1735 (RA;US)
Low-frequency anomalies in the NMC MRF model and reality, 20:1718 (RA;US)
Low-frequency variation of a zonally localized jet stream: Observation and theory, 20:1717 (RA;US)
Maintenance of extratropical low-frequency variabilities in the atmosphere, 20:1737 (RA;US)
Northern hemispheric response to large volcanic eruptions in relation to El Nino - winter case studies, 20:1724 (RA;US)
On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic, 20:1731 (RA;US)
On the intra-seasonal variability within the extratropics in a general circulation model and observational data, 20:1729 (RA;US)
Potential vorticity dynamics for global scale circulations, 20:1727 (RA;US)
Potential vorticity dynamics in the Canadian Climate Centre GCM, 20:1725 (RA;US)
Predictability of blocking, 20:1738 (RA;US)
Rossby wave propagation and teleconnections for the Northern Hemisphere summer flow, 20:1713 (RA;US)
Scaling of saturation amplitudes in baroclinic instability, 20:1734 (RA;US)
Stochastic excitation of low frequency variability in the midlatitude atmosphere, 20:1723 (RA;US)
Synoptic scale eddies in the Northern Hemisphere summer: A POP analysis, 20:1719 (RA;US)
The importance of resolution on the response of mid-latitude transients to enhanced CO_2, 20:1733 (RA;US)
The role of eddy transports in climate change, 20:1712 (RA;US)
Transient and stationary eddies in differing GCM climates, 20:1721 (RA;US)
Transient eddies and low frequency variability in the Northern Hemisphere winter climates of two GCMs, 20:1722 (RA;US)
Transient eddy feedback and low-frequency variability, 20:1732 (RA;US)
Wave-mean flow interaction and the baroclinic adjustment hypothesis, 20:1728 (RA;US)

Mechanical Technology, Inc., Latham, NY (United States)
Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April–June, 1994, 20:1433 (R;US)

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Environmental Hazards Assessment Program: Quarterly report, July 1994–September 1994, 20:916 (R;US)
Medical University of South Carolina Environmental Hazards Assessment Program annual report, July 1, 1993–June 30, 1994, 20:2448 (R;US)
Medical University of South Carolina Environmental Hazards Assessment Program: Deliverables: Volume 2, Annual report, July 1, 1993–June 30, 1994, 20:2449 (R;US)
Medical University of South Carolina Environmental Hazards Assessment Program: Deliverables: Volume 3, Annual report, July 1, 1993–June 30, 1994, 20:2450 (R;US)

Melbourne Univ., Parkville, VIC (Australia). School of Physics
A covariant canonical description of Liouville field theory, 20:2067 (R;AU)
A partial unification model in non-commutative geometry, 20:2099 (R;AU)
Anomalous WWZ couplings and $K_L \rightarrow \mu^+ \mu^-$, 20:2184 (R;AU)

Asymptotics for the Kummer function of Bose plasmas, 20:2003 (R;AU)
Can the electric charges of elementary particles change with time?, 20:2200 (R;AU)
Can we test the many-Hilbert-space approach to quantum mechanics?, 20:2005 (R;AU)
Conductivity in insulators due to implantation of conducting species, 20:2360 (R;AU)
Magnetized pair Bose gas: relativistic superconductor, 20:2398 (R;AU)
Matrix element and complex l-plane evaluation of two-loop vacuum amplitudes in QED on S4, 20:2071 (R;AU)
Monte Carlo simulations with indefinite and complex-valued measures, 20:2027 (R;AU)
Observation of the scalar Aharonov-Bohm effect by neutron interferometry, 20:2004 (R;AU)
On the effects of gravitational fields on the electrical properties of matter, 20:2006 (R;AU)
Pulsed laser annealing of P implanted diamond, 20:1289 (R;AU)
Staggered magnetization in the Heisenberg antiferromagnet, 20:2074 (R;AU)
Statistical mechanics of magnetized pair Fermi gas, 20:2070 (R;AU)
Statistical mechanics of relativistic spin-1 bosons in a magnetic field, 20:2072 (R;AU)
Statistical mechanics of the magnetized pair Bose gas, 20:2069 (R;AU)
Study of the simplest realistic Higgs sector in quark-lepton symmetric models, 20:2183 (R;AU)
Surface plasmon observed for carbon nanotubes, 20:2345 (R;AU)
Ten dimensional SO(10) G.U.T. models with dynamical symmetry breaking, 20:2066 (R;AU)
The $^{13}C(e,p_{0,1})^{12}B$ differential cross section, 20:2275 (R;AU)
The Hamiltonian of SU(2) lattice gauge theory in approximate tridiagonal form, 20:2073 (R;AU)
The space of solutions of Toda field theory, 20:2068 (R;AU)
Two dimensional Bose plasma in a magnetic field, 20:2428 (R;AU)

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Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)

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Radiopharmaceuticals for diagnosis: Final report, 20:1873 (R;US)

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Feasibility of a novel approach for fast, economical determination of radiation damage in nuclear reactor cores: Progress report, [November 1, 1993–October 31, 1994], 20:807 (R;US)
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The Schleswig-Holstein energy model, 20:905 (I;DE;In German)

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Results of the Baden-Wuerttemberg cultivation experiments with sunflowers, soybeans and flax plants, 1992, 20:619 (I;DE;In German)

Ministerium fuer Umwelt, Energie und Bundesangelegenheiten des Landes Hessen, Wiesbaden (Germany)
Avoidance of hazardous wastes in Hesse - CC residues: Phase II: Avoidance potential. Phase III: Practical application. Results, 20:1043 (I;DE;In German)

Ministry of Science and Technology, Jerusalem (Israel)
*On the second law efficiency of thermal energy storage, 20:649 (IA;IL)
A comparative configuration assessment of a solar thermal plant in the Eilat area, 20:660 (IA;IL)
Assessment of performance and economics of parabolic trough solar electric systems for selected Mediterranean countries, 20:669 (IA;IL)
Benefits of deploying solar systems at large scale and to provide energy in various forms, 20:656 (IA;IL)
Characterization of mirror reflectivity losses caused by dust deposited under various meteorological conditions, 20:648 (IA;IL)
Comparative assessment of the costs and benefits of solar thermal concentrating technologies for power generation, 20:661 (IA;IL)
Comparative assessment of the technical performance of solar thermal concentrating technologies for power generation, 20:668 (IA;IL)
Comparative assessments of solar and conventional power plants, 20:671 (IA;IL)
Comparative evaluation of solar power generation options: A user's perspective, 20:667 (IA;IL)
Comparative studies of direct and indirect absorption of concentrated solar flux for chemical storage of solar energy, 20:665 (IA;IL)
Comparison of SEGS solar field performance from laboratory and operating plant testing, 20:651 (IA;IL)
Correct measurements of the efficiency of solar cells as a basis for their comparative techno-economical analysis, 20:662 (IA;IL)
Efficiency measures in solar electrical production: A consistent terminology, 20:659 (IA;IL)
Evaluation of performance and cost trade-off in the optimization of solar dish electric system, 20:670 (IA;IL)
Evaluation of the total cost of different photovoltaic cells and combined photovoltaic-thermal solar designs for the first Russian photovoltaic 1 MW power plant, 20:663 (IA;IL)
Grid-connected solar power generation a utility's view, 20:680 (IA;IL)
Industrial opportunities for solar tower technologies in Israel, 20:652 (IA;IL)
Large scale maximum concentration central receiver systems, 20:681 (IA;IL)
Life cycle analysis of photovoltaic-supplied solar filling stations for electric passenger vehicles, 20:654 (IA;IL)
Methods of evaluating benefits of solar fuel and power production, 20:676 (IA;IL)
On the optimization of the solar-driven combined cycle, 20:664 (IA;IL)
Optimal design of large solar fields: Maximum energy output, 20:643 (IA;IL)
Outdoor I-V curves versus simulator measurements for characterizing photovoltaic modules, 20:647 (IA;IL)
Paraboloidal-dish solar power system: Comparative and economicaspects, 20:655 (IA;IL)
Performance indicators for solar pipes with phase change storage, 20:658 (IA;IL)
Photo catalysis and radiation absorption in a solar plant, 20:666 (IA;IL)
Photovoltaics: Present status and comparative analyses, 20:673 (IA;IL)
Potential uses of solar energy for water desalination, 20:653 (IA;IL)
Residential photovoltaic hybrid power system, 20:657 (IA;IL)
Second law aspects of solar thermal energy conversion, 20:644 (IA;IL)
Solar dish/Stirling technology, a world status report and comparison, 20:678 (IA;IL)
Solar thermal activities in Australia: An overview, 20:679 (IA;IL)
Techno-electronic comparison of advanced solar power plant schemes, 20:672 (IA;IL)
The Ikarus project, 20:918 (IA;IL)
The relative degradation of various kinds of photovoltaic module after 6-7 years exposure to desert conditions, 20:646 (IA;IL)
The solar two project: A status and discussion of performance assessment, 20:650 (IA;IL)
The technoeconomic evaluation of solar steam supply to fossil fired combined power cycle, 20:674 (IA;IL)
Thermal storage for solar dynamic power generation: Performance indicators in a second law perspective, 20:645 (IA;IL)
Thermodynamics of solar power conversion, 20:675 (IA;IL)
Uniform guidelines for reporting dish/Stirling solar electric system performance to permit comparison, 20:677 (IA;IL)

Ministry of Social Affairs and Health, Helsinki (Finland)
Nationwide rural well water survey: The quality of household water and factors influencing it, 20:1842 (R;FI;In Finnish)

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Evaluation of the Finnish nuclear waste management programme: Report of the WATRP review team, 20:285 (R;FI)
Nuclear energy research until 2000: The necessity of the nuclear energy research until the year 2000 and a proposal for the organizational model of the research, 20:2515 (R;FI;In Finnish)
Minnesota Univ., Minneapolis, MN (United States)
Hot coal gas desulfurization with manganese-based sorbents: Quarterly report, January–March 1994, 20:15 (R;US)
Mission Research Corp., San Diego, CA (United States)
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Mississippi Univ., University, MS (United States). Dept. of Chemical Engineering
Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994, 20:69 (R;US)
Missouri Univ., Rolla, MO (United States)
Experimental investigations of electron capture from atomic hydrogen and deuterium by alpha particles: Final report, September 15, 1984–September 14, 1993, 20:2403 (R;US)
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Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993, 20:2221 (R;US)
Moratuwa Univ. (Sri Lanka). Dept. of Electrical Engineering
Electricity pricing, 20:892 (I;LK)
Morgan State Univ., Baltimore, MD (United States). School of Engineering
Analysis/control of in-bed tube erosion phenomena in the fluidized bed combustion (FBC) system, 20:1490 (R;US)
Investigation of heat transfer and combustion in the advanced Fluidized Bed Combustor (FBC): Technical progress report No. 3, April 1, 1994–June 30, 1994, 20:1491 (R;US)
Mount Sinai School of Medicine, New York, NY (United States). Dept. of Physiology and Biophysics
Molecular mechanisms in radiation damage to DNA: Progress report, 20:1914 (R;US)
Muenchen Univ. (Germany). Sektion Physik
Development of the optical components of an alignment system for the muon spectrometer of the ATLAS detector, 20:1654 (R;DE;In German)

N

National Academy of Sciences - National Research Council, Washington, DC (United States)
Assessment of the current status of basic nuclear data compilations, 20:2202 (R;US)
Workshop on establishing institutional credibility for SEAB Task Force on Radioactive Waste Management, 20:906 (R;US)
National Atomic Energy Agency, Warsaw (Poland)
Application of isotopes and radiation for industry and environmental protection, 20:588 (IA;PL)
Development of nuclear power in Sweden, 20:965 (IA;PL)
National arrangement to handle nuclear emergencies, 20:2578 (IA;PL)
Nuclear energy and natural environment. Information seminar, 20:587 (I;PL)
Nuclear energy and the natural environment, 20:1884 (IA;PL)
Nuclear energy in Ukraine. State and problems, 20:967 (IA;PL)
Nuclear power in Finland. Present status and trends, 20:969 (IA;PL)
Nuclear power in Germany, 20:968 (IA;PL)
Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)
Nuclear power. Status and development trends, 20:963 (IA;PL)
Nuclear techniques in food and agriculture with special reference to environmental protection, 20:1905 (IA;PL)
Nuclear technology in hydrological and environmental research, 20:589 (IA;PL)
Radiation and health, 20:1886 (IA;PL)
Radiation technologies and nuclear techniques friendly to man and environment, 20:590 (IA;PL)
Radioactive waste management, 20:283 (IA;PL)
Report of the Chernobyl state committee of the Republic of Belarus, 20:837 (IA;PL)
The application of nuclear technology in cancer radiotherapy, 20:1885 (IA;PL)
The energy issue in Sweden. Can society handle technology poorly understood by its citizens?, 20:964 (IA;PL)
The management of site contamination, 20:1701 (IA;PL)
National Board of Waters and Environment, Helsinki (Finland)
Nationwide rural well water survey: The quality of household water and factors influencing it, 20:1842 (R;FI;In Finnish)
National Committee for Rock Mechanics, Washington, DC (United States)
Advances in technology for the construction of deep-underground facilities, 20:1677 (R;US)
National Committee on Tunneling Technology, Washington, DC (United States)
Advances in technology for the construction of deep-underground facilities, 20:1677 (R;US)
National Fertilizer and Environmental Research Center, Muscle Shoals, AL (United States)
Nitrogen accumulation profiles of selected grain and vegetable crops: A bibliography (1940-1992), 20:1870 (R;US)
Solar concentration/destruction of pesticide rinsewater, 20:695 (R;US)
Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
National Inst. of Environmental Health Sciences, Research Triangle Park, NC (United States). Lab. of Molecular Genetics
Transformation-associated recombination between diverged and homologous DNA repeats is induced by strand breaks, 20:1866 (R;US)
National Inst. of Radiological Sciences, Chiba (Japan)
Age-dependence of susceptibility, 20:1927 (RA;JP;In Japanese)
Analysis of the clonality of prelymphoma cells and approach to the study of initial events on radiation-induced lymphomagenesis, 20:1937 (RA;JP;In Japanese)
Cancer incidence in the atomic bomb survivors, 20:1938 (RA;JP;In Japanese)
Cell interaction in the thymic microenvironment, 20:1936 (RA;JP;In Japanese)
Effect of radiation on transgenic mice carrying a variety of oncogenes, 20:1929 (RA;JP;In Japanese)
Extracellular matrix in carcinogenesis, 20:1935 (RA;JP;In Japanese)
Gene rearrangement and radiation carcinogenesis: BCR/ABL and RET oncogene, 20:1931 (RA;JP;In Japanese)
Influence of dose-rate on tumorigenesis in mice irradiated with gamma-rays from cesium 137, 20:1925 (RA;JP;In Japanese)
P53 in differentiation of thyroid cancer, 20:1932 (RA;JP;In Japanese)
Radiation and offspring cancer, 20:1928 (RA;JP;In Japanese)
Roles of gap junctions and tight junctions in the development of liver cancer and metastatic tumors, 20:1934 (RA;JP;In Japanese)
Suppression of radiation-induced in vitro carcinogenesis by ascorbic acid, 20:1939 (RA;JP;In Japanese)
The effect of calorie restriction of radiation-induced myeloid leukemogenesis, 20:1940 (RA;JP;In Japanese)
The SCID-hu mouse and its application to human radiation biology: Analysis of sensitivity to X-irradiation using a bone marrow model, 20:1933 (RA;JP;In Japanese)
Threshold-like dose response of skin carcinogenesis by repeated beta irradiation in mice, 20:1926 (RA;JP;In Japanese)
TL transgenic mouse strains, 20:1930 (RA;JP;In Japanese)
National Lab. for High Energy Physics, Tsukuba, Ibaraki (Japan)
60MW S-band pulse klystron, 20:1566 (RA;JP;In Japanese)
A light scalar top search by venus detector, 20:2174 (RA;JP)
A study of single photon production with the TOPAZ detector, 20:2175 (RA;JP)
Application of traveling-wave type RF window in L and S bands, 20:1579 (RA;JP;In Japanese)

Behavior of off-centered beams in an RFQ due to image charge force, 20:1536 (RA;JP)
Can stop be light enough for TRISTAN?, 20:2173 (RA;JP)
Cold model test of a DTL with transition from 4π to 2π-mode acceleration, 20:1538 (RA;JP;In Japanese)
$D^{*\pm}$ production in two-photon process, 20:2171 (RA;JP)
Design and construction of the TIT RFQ, 20:1559 (RA;JP;In Japanese)
Design of a beam transport line between the RFQ and the DTL for the 1-GeV proton linac, 20:1562 (RA;JP;In Japanese)
Design of an RF window for L-band CW klystron based on thermal-stress analysis, 20:1577 (RA;JP;In Japanese)
Design of MEBT short Q-magnets with large bores using MAFIA for the JHP proton linac, 20:1561 (RA;JP;In Japanese)
Development of an S-band RF window for linear colliders, 20:1580 (RA;JP;In Japanese)
Development of an X-band klystron modulator using a pulse-forming line and magnetic switch, 20:1573 (RA;JP;In Japanese)
Development of annular coupled structure, 20:1564 (RA;JP;In Japanese)
Development of recirculating RF pulse compression system, 20:1576 (RA;JP;In Japanese)
Development of the S-band high power RF load. 3, 20:1581 (RA;JP;In Japanese)
Development of X-band high power pulsed klystrons, 20:1570 (RA;JP;In Japanese)
High power test of L-band RF window using resonant ring, 20:1578 (RA;JP;In Japanese)
High-power test of a prototype of power supplies for UHF klystrons, 20:1571 (RA;JP;In Japanese)
Inclusive K_s^0 production in two photon processes, 20:2170 (RA;JP)
Low power RF field tuning of a four-vane type RFQ for the JHP, 20:1558 (RA;JP;In Japanese)
Measurement of inclusive electron cross section in $\gamma\gamma$ collisions, 20:2169 (RA;JP)
Measurement of the $D^{*\pm}$ cross section using a soft-pion analysis in two-photon processes, 20:2172 (RA;JP)
Monte Carlo calculation of electron beam dose distribution in water, 20:606 (RA;JP;In Japanese)
Multipactors in klystron cavities, 20:1568 (RA;JP;In Japanese)
On limitations and improvements of klystron design code 'JPNDISK', 20:1569 (RA;JP;In Japanese)
Particle optics in the TIT-RFQ calculated using a 3D particle-in-cell code, 20:1537 (RA;JP;In Japanese)
Performance of the 46MW klystron for KEK B-factory, 20:1567 (RA;JP;In Japanese)
Production and high power test of an S-band SLED with dual sidewall coupling irises, 20:1574 (RA;JP;In Japanese)
R and D works of the DTL for the BTA in JAERI, 20:1563 (RA;JP;In Japanese)
RF control of ICR proton linac, 20:1556 (RA;JP;In Japanese)
RF system of FELI linac, 20:1565 (RA;JP;In Japanese)
Study of a double gapped buncher for proton linac, 20:1560 (RA;JP;In Japanese)
The solid-state rf power amplifier for accelerator, 20:1582 (RA;JP;In Japanese)
Tunable frequency 4-rod RFQ, 20:1557 (RA;JP;In Japanese)
Upgrade of the PF linac klystron modulator for the KEK B-factory project, 20:1572 (RA;JP;In Japanese)
Upgrade of the RF source for PF linac by pulse compression, 20:1575 (RA;JP;In Japanese)

National Regulatory Research Inst., Columbus, OH (United States)
Restructuring local distribution services: Possibilities and limitations, 20:138 (R;US)

National Renewable Energy Lab., Golden, CO (United States)
14th Annual international meeting of wind turbine test stations: Proceedings, 20:724 (R;US)
Advanced processing technology for high-efficiency, thin-film $CuInSe_2$ and CdTe solar cells: Annual subcontract report, 1 March 1993–28 February 1994, 20:687 (R;US)
Current Hybrid Electric Vehicle performance based on temporal data from the world's largest HEV fleet, 20:1083 (R;US)
Growth and development of GaInAsP for use in high-efficiency solar cells: Final subcontract report, 1 July 1991–30 December 1993, 20:689 (R;US)
Large-area triple-junction a-Si alloy production scaleup: Annual subcontract report, 17 March 1993–18 March 1994, 20:686 (R;US)
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Program and abstracts, 20:629 (R;US)
Research on stable, high-efficiency amorphous silicon multijunction modules: Final subcontract report, 1 January 1991–31 August 1994, 20:685 (R;US)
Silicon-Film™ photovoltaic manufacturing technology: Semiannual subcontract report, 15 October 1993–15 April 1994, 20:684 (R;US)
Solar Radiation Resource Assessment Project: Program overview of fiscal year 1993, 20:642 (R;US)
The Utility Battery Storage Systems Program Overview, 20:726 (R;US)
Thin-film cadmium telluride photovoltaic cells: Final subcontract report, 1 November 1992–1 January 1994, 20:688 (R;US)
Travel to Japan for discussion on renewable energy projects: Foreign trip report, February 9–March 4, 1994, 20:614 (R;US)
Village power hybrid systems development in the United States, 20:1001 (R;US)

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Engineering faculty forum: Final report, June 1, 1993–May 31, 1994, 20:926 (R;US)

Natsional'nyi Nauchnyi Tsentr, Kharkov (Ukraine). Khar'kovskij Fiziko-Tekhnicheskij Inst.
About influence of silver additions on superconducting properties of the HTSC ceramic, 20:1226 (IA;UA;In Russian)
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Investigation of thermal conductivity in polymer-ceramic HTSC composites., 20:1279 (IA;UA;In Russian)
Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Nuclear-physical researches (Theory and experiments). Scientific-technical collection., 20:1222 (I;UA)
Particularities of copper structure state after low-temperature recrystallization, 20:1141 (IA;UA;In Russian)
Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)
Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites., 20:1228 (IA;UA;In Russian)
Superconducting, kinetic and structural properties of the quenched ceramic samples Bi, Pb-Sr-Ca-Cu-O, 20:1224 (IA;UA;In Russian)
Temperature dependence of displacement module and internal friction in Ga As monocrystals., 20:1142 (IA;UA;In Russian)
Thermal processes at compacted composite Y Ba_2 Cu_3 O_δ/Ag cooling by liquid nitrogen., 20:1231 (IA;UA;In Russian)
Variation of properties of the HTSC ceramic doped by silver., 20:1227 (IA;UA;In Russian)

Naval Research Lab., Washington, DC (United States)
Transport efficiency studies for light-ion inertial confinement fusion, 20:2446 (R;US)
X-ray spectroscopy of xenon: Final report, 20:2281 (R;US)

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Assessment of vanadium alloys for ITER application, 20:1113 (R;NL)

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A two-dimensional simulation of tritium transport in the vadose zone at the Nevada Test site, 20:1850 (R;US)

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Novel microorganism for selective separation of coal from ash and pyrite: Third quarterly technical progress report, March 1, 1994–May 31, 1994, 20:40 (R;US)

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Photophysical processes on triplet states and radical ions in pure and molecularly doped polymers, 20:1376 (R;US)

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Brown coal liquefaction project.: Technical summary, 20:42 (I;JP;In Japanese)
Conceptual study of model introduced to utilize wastes as energy in Hokkaido, 20:1048 (R;JP;In Japanese)
Development of brown coal liquefaction technology. 2.: Economical performance investigation on the brown coal liquefaction process, 20:43 (I;JP;In Japanese)
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
Feasibility study of power generation system with shape memory alloys, 20:1159 (R;JP;In Japanese)
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
Fiscal 1993 investigational research on the development of a peat utilization mild gas production system, 20:47 (I;JP;In Japanese)
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Lectures on the Pacific rim region Coal Workshop 1993, 20:93 (I;JP;In Japanese)
Possibility of introducing heat storage technologies to Hokkaido, 20:894 (R;JP;In Japanese)
Possibility of introducing new energy technologies to the South Pacific island countries, 20:1000 (R;JP;In Japanese)
Preliminary investigation on Japan's cooperation with Mongolia for coal liquefaction technology, 20:46 (I;JP;In Japanese)
Present status of petroleum substitution energy (USA), 20:1089 (R;JP;In Japanese)
Present status of petroleum substitution energy (EC), 20:1090 (R;JP;In Japanese)
Present status of petroleum substitution energy (UK), 20:1091 (R;JP;In Japanese)
Present status of petroleum substitution energy (France), 20:1092 (R;JP;In Japanese)
Present status of petroleum substitution energy (Germany), 20:1093 (R;JP;In Japanese)
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Promoted structuring of model to introduce petroleum substitution energy in Hokkaido's New City Base for Regional Administration of Industry and Culture, 20:1060 (I;JP;In Japanese)
Research on the power generation system with thermoelectric conversion elements, 20:1003 (R;JP;In Japanese)
Research on the promotion measures to introduce new energy and energy-saving technologies with a leasing system, 20:929 (R;JP;In Japanese)
Survey of 1993 coal production/utilization technology promotion subsidy area models.: Area model survey as measures for environmental load reduction (interim report), 20:1047 (R;JP;In Japanese)
Survey on econometric analysis of petroleum substitution energy for fiscal 1993, 20:1094 (R;JP;In Japanese)
Survey on the actual energy consumption status for the residential/economical use, 20:998 (R;JP;In Japanese)
Survey report on geothermal energy development and the environment (landscape). 2, 20:715 (R;JP;In Japanese)
Technological verification of geothermal exploration in 1992.: Development of fractured reservoir exploration and electromagnetic wave-utilizing exploration (development of array CSMT), 20:711 (I;JP;In Japanese)

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Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures, 20:1948 (R;US)

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Report on joint ecogeochemical mapping and monitoring in the West Murmansk Region and the contiguous areas of Finland and Norway, 20:1823 (R;NO)

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Advanced growth and surface analysis system for in situ studies of interface formation: Annual technical report, 20:2312 (R;US)

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Boron neutrino flux and the MSW solution of the solar neutrino problem, 20:2149 (R;US)
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North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center
Sour gas plant subsurface remediation technology research and demonstration project: Quarterly technical progress report, January 1, 1994–March 31, 1994, 20:139 (R;US)
Trace element emissions, 20:63 (R;US)

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Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)

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Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)
Strong interactions studies with medium energy probes: Progress report, 1993–1994, 20:2079 (R;US)
Studies in nonlinear problems of energy: Progress report, October 1, 1993–September 30, 1994, 20:1422 (R;US)

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Photoinduced charge transfer between fullerenes and TiO_2 semiconductor colloids, 20:1373 (R;US)

NOVETECH Corp., Rockville, MD (United States)
A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)

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A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)
Buckling evaluation of System 80+™ containment, 20:879 (R;US)
Heavy-Section Steel Irradiation Program: Volume 2, No. 2: Semiannual progress report, April–September 1991, 20:1160 (R;US)
Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)
The effects of aging on BWR core isolation cooling systems, 20:878 (R;US)
Unirradiated material properties of Midland weld WF-70, 20:1161 (R;US)

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Indexes to Nuclear Regulatory Commission Issuances, January–June 1994, 20:794 (R;US)
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Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3070), 20:149 (R;US)
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Nuclear Regulatory Commission, Washington, DC (United States). Div. of Industrial and Medical Nuclear Safety
Predicting the pressure driven flow of gases through micro-capillaries and micro-orifices, 20:1442 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Regulatory Applications
Validation studies for assessing unsaturated flow and transport through fractured rock, 20:1824 (R;US)

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Proceedings of workshop I in advanced topics in risk and reliability analysis: Model uncertainty: Its characterization and quantification, 20:874 (R;US)

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Precursors to potential severe core damage accidents: 1993, A status report: Volume 19: Main report and appendices A–D, 20:875 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 20: Appendices E and F, 20:876 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research
Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)
Human factors engineering guidance for the review of advanced alarm systems, 20:830 (R;US)
Local control stations: Human engineering issues and insights, 20:831 (R;US)
RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3, 20:877 (R;US)
Risk impact of BWR technical specifications requirements during shutdown, 20:880 (R;US)

Nuclear Regulatory Commission, Washington, DC (United States). Div. of Waste Management
Staff Technical Position on consideration of fault displacement hazards in geologic repository design, 20:292 (R;US)

Nuclear Research Centre, Inshas (Egypt)
A safeguards approach applicable to A plutonium mixed oxide powder plant, 20:162 (R;EG)
A software package to process an INIS magnetic tape on the VAX computer, 20:2531 (R;EG)
A two dimensional code (R,Z) for nuclear reactor analysis and its application to the UAR-RI reactor, 20:840 (R;EG)
Collision integrals for the Lennard-jones (n-6) potential for 23 values of n ranging from 6 to proper to, 20:2287 (R;EG)
Confinements systems in nuclear facilities other than nuclear reactors, 20:805 (R;EG)
Determination of relative efficiency of a GMX-detector, 20:2224 (R;EG)
Development of IAEA safeguards at low enrichment uranium fuel fabrication plants, 20:161 (R;EG)
Electrochemical recovery of iron from iron and steel pickling wastes, 20:1339 (R;EG)
Electronic spectra of plutonium ions in nitric acid and in lithium nitrate solutions, 20:1409 (R;EG)
Electronic stability and reproducible accuracy of HARSHAW 2000(A,B) TLD-analyzer, 20:1480 (R;EG)
Extraction of U, Th and gross gamma fission products by irradiated (HTTA-TBP) mixtures, 20:1377 (R;EG)
High temperature high vacuum creep testing facilities, 20:1479 (R;EG)
Highly reliable computer network for real time system, 20:821 (R;EG)
Inventory calculation for an irradiated HTGR fuel element, 20:768 (R;EG)
Investigation of the oxidation of hydrochloric acid in scrubbing solutions containing hydrogen peroxide, 20:160 (R;EG)
Nuclear fuel cycles : description, demand and supply estimates, 20:795 (R;EG)
Parameters affecting the calibration uniformity and traceability of gamma measuring devices, 20:1907 (R;EG)
Plasma focus matching conditions, 20:2401 (R;EG)
Plasma rotation in coaxial discharges, 20:2399 (R;EG)
Quality control in nuclear fuel fabrication, 20:146 (R;EG)
Radiolysis of tri-n-butyl phosphate solutions effect of absorbed dose on extractability of uranium fission products and nitric acid, 20:159 (R;EG)
Reactor elements properties response during a postulated loss-of-coolant accident (LOCA), 20:804 (R;EG)
Review of the main results of source terms studies under core melting conditions, 20:833 (R;EG)
Safety in design and operation of low energy particle accelerators, 20:1513 (R;EG)
Size and surface AREA analysis of some metallic and intermetallic powders, 20:1292 (R;EG)
Some aspects on neutron dosimetry, 20:1615 (R;EG)
The metallurgy of superalloys part 1., 20:1101 (R;EG)
The metallurgy of superalloys part 2, 20:1102 (R;EG)
Viscosity effect on plasma sheath dynamic in plasma focus, 20:2400 (R;EG)

Nuclear Waste Commission of Finnish Power Companies, Helsinki (Finland)
Geochemical modelling of the groundwater at the Olkiluoto site, 20:1861 (R;FI)

O

Oak Ridge Inst. for Science and Education, TN (United States)
Current distribution in Cable-In-Conduit Conductors, 20:2433 (R;US)

Oak Ridge K-25 Site, TN (United States)
AES6.0F: Automated Estimating System, 20:2537 (CM;US)
Field demonstration of rapid turnaround, multilevel groundwater screening, 20:1821 (R;US)

Oak Ridge National Lab., TN (United States)
A modular dexterous robot for glove box applications, 20:1461 (R;US)
A neural network approach to the study of dynamics and structure of molecular systems, 20:2280 (R;US)
A new Krylov-subspace method for symmetric indefinite linear systems, 20:2552 (R;US)
A visual cell for measuring the solubility of prograde soluble salts in water at high temperatures and pressures, 20:1367 (R;US)
Abbreviations, acronyms, and initialisms frequently used by Martin Marietta Energy Systems, Inc.: Second edition, 20:2569 (R;US)
Addendum to the remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 ponds, boneyard/burnyard, oil landfarm, sanitary landfill I, and the burial grounds, including oil retention ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. main text, 20:242 (R;US)
Adventures in supercomputing, a K-12 program in computational science: An assessment, 20:1427 (R;US)
An examination of the elastic structural response of the Advanced Neutron Source fuel plates, 20:607 (R;US)
Analysis of criticality alarm system response to an accidental criticality outside the cascade process buildings at the Portsmouth Gaseous Diffusion Plant, 20:151 (R;US)
Angular and charge state distributions of highly charged ions scattered during low energy surface-channeling interactions with Au(110), 20:2347 (R;US)
Atom probe field ion microscopy and related topics: A bibliography 1993, 20:1488 (R;US)
Automatic generation of fuzzy rules for the sensor-based navigation of a mobile robot, 20:1038 (R;US)
Ceramic fiber ceramic matrix filter development, 20:1492 (R;US)
Clad vent set cup open end (closure weld zone) wall-thickness study, 20:819 (R;US)

Comparison of methods for developing contaminant-particle size distributions for suspended sediment, 20:227 (R;US)
Computational modeling of diffusion-controlled transformations in ternary systems, 20:1106 (R;US)
Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment, 20:449 (R;US)
Cost-effective ceramics program in the United States, 20:1173 (R;US)
Creep behavior in SiC whisker-reinforced alumina composite, 20:1240 (R;US)
Defining the role of risk assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation process at the DOE-OR, 20:499 (R;US)
Descriptions of representative contaminated sites and facilities within the DOE complex, 20:511 (R;US)
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)
Design/Installation and Structural Integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory, 20:244 (R;US)
Effect of a solid insulator on the spark yield of S_2F_{10} in SF_6*, 20:887 (R;US)
ELIPGRID-PC: A PC program for calculating hot spot probabilities, 20:1827 (R;US)
Energy efficiency in military family housing: Inspection results, 20:1030 (R;US)
Error analysis of the quadratic nodal expansion method in slab geometry, 20:2277 (R;US)
Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results, 20:863 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:461 (R;US)
Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:462 (R;US)
Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:463 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:464 (R;US)
Guidance for the design and management of a maintenance plan to assure safety and improve the predictability of a DOE nuclear irradiation facility: Final report, 20:882 (R;US)
Heavy-Section Steel Irradiation Program: Volume 2, No. 2: Semiannual progress report, April–September 1991, 20:1160 (R;US)
Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 1, Introduction, 20:1795 (R;US)
Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 2, Interim business systems guidance, 20:1796 (R;US)
IRP and the electricity industry of the future: Workshop results, 20:994 (R;US)
Learning algorithms for feedforward networks based on finite samples, 20:2554 (R;US)
Methodologies for estimating one-time hazardous waste generation for capacity generation for capacity assurance planning, 20:1826 (R;US)
Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures, 20:1948 (R;US)
National Information Infrastructure Education Forum: A summary report, 20:930 (R;US)
Negotiating equity for management of DOE wastes, 20:226 (R;US)
Neutron diffraction study of the magnetic ordering of $BaCuO_{2+x}$, 20:1174 (R;US)
Non destructive characterization using pulsed fast-thermal neutrons, 20:1293 (R;US)
Oak Ridge background soils project provides data for remedial action evaluation, 20:224 (R;US)
Operator's manual for the multistation offgas analysis system, 20:1489 (R;US)
Perennial grass production for biofuels: Soil conversion considerations, 20:630 (R;US)
Plasma processing for integrated circuits, 20:1498 (R;US)
Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 19: Main report and appendices A–D, 20:875 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 20: Appendices E and F, 20:876 (R;US)
Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)
Proceedings of the Low-Slope Reroofing Workshop: A review of the alternatives, 20:1430 (R;US)
Proposed Atomic Energy of Canada Ltd. ^{99}Mo waste calcination process, 20:293 (R;US)
QMRPACK and applications, 20:2551 (R;US)
QMRPACK user's guide, 20:2553 (R;US)
Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes, 20:494 (R;US)
Remedial investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendixes, 20:495 (R;US)
Resource Conservation and Recovery Act (RCRA) Part B permit application for container storage units at the Oak Ridge Y-12 Plant, 20:445 (R;US)
Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V), 20:504 (R;US)
Results of the radiological and beryllium verification survey at the Peek Street Site, Schenectady, New York (SY001V), 20:505 (R;US)
Risk evaluation of embedded, single-walled liquid low-level waste piping at Oak Ridge National Laboratory: ESD Publication 4315, 20:246 (R;US)
Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department, 20:294 (R;US)
Scale-up and modeling of forced chemical vapor infiltration, 20:725 (R;US)
Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:465 (R;US)
Simulation and performance analysis of a quadruple-effect lithium bromide-water absorption, 20:1015 (R;US)
Site characterization report for Building 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program, 20:508 (R;US)
Site-specific standard request for Underground Storage Tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility Buildings 9754-1 and 9720-15, 20:545 (R;US)
Solution of potential flow problems on a network of workstations, 20:2533 (R;US)
Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique, 20:295 (R;US)
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)
Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics, 20:1172 (R;US)
Technical basis for beta skin dose calculations at the Y-12 Plant, 20:1947 (R;US)
The feasibility of replacing or upgrading utility distribution transformers during routine maintenance, 20:885 (R;US)

The North Carolina Field Test: Field performance of the preliminary version of an advanced weatherization audit for the Department of Energy's Weatherization Assistance Program, 20:1029 (R;US)
The Plant-Window system: A flexible, expandable computing environment for the integration of power plant activities, 20:806 (R;US)
The Y-12 Plant - a model for environmental excellence, 20:939 (R;US)
Thermal modeling of packages for normal conditions of transport with isolation, 20:1429 (R;US)
Time-dependent, low-dose reporting limit for dosimeters that are taken home at the end of the workday, 20:1911 (R;US)
Toxicological benchmarks for wildlife: 1994 Revision, 20:457 (R;US)
Unirradiated material properties of Midland weld WF-70, 20:1161 (R;US)
Unknown-terrains navigation of a mobile robot using an array of sonars, 20:1432 (R;US)
Uranium removal from soils: An overview from the Uranium in Soils Integrated Demonstration program, 20:223 (R;US)
Waste management plan for the remedial investigation of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:507 (R;US)
Waste management regulatory compliance issues related to D&D activities at Oak Ridge National Laboratory (ORNL), 20:225 (R;US)
Work plan for the treatability study for PCB dehalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:1790 (R;US)
[Low-slope re-roofing workshop keynote], 20:1431 (R;US)

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Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)
Direct effects of atmospheric CO_2 enrichment on plants and ecosystems: An updated bibliographic data base, 20:1968 (R;US)

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Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:506 (R;US)

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Navy radon assessment and mitigation program: Final report, 20:1740 (R;US)

Oak Ridge Y-12 Plant, TN (United States)
Closure certification report for the Bear Creek burial grounds B area and walk-in pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, 20:444 (R;US)
Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1, 20:478 (R;US)
Remedial Investigation Report on Chestnut Ridge Operable Unit 2 (Filled Coal Ash Pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. Main Text, 20:735 (R;US)
Resource Conservation and Recovery Act (RCRA) contingency plan for hazardous waste treatment, storage, and disposal units at the Oak Ridge Y-12 Plant, 20:546 (R;US)
Resource Conservation and Recovery Act (RCRA) Part B Permit Application for Production Associated Units at the Oak Ridge Y-12 Plant, 20:446 (R;US)
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)
The February 21, 1993 tornadoes of East Tennessee, 20:544 (R;US)
Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)

Office of Atomic Energy for Peace, Bangkok (Thailand)
Adsorption of silver ion on activated carbon via radiochemical method, 20:1306 (IA;TH;In Thai)
Application of prompt gamma ray neutron activation analysis, 20:611 (IA;TH;In Thai)
Application of radioactivity in clinical analysis by radioimmunoassay technique, 20:1883 (IA;TH;In Thai)
Carbon-14 in the marine environment of the gulf of Thailand, 20:1852 (IA;TH;In Thai)
Cesium-137 in the marine environment of the gulf of Thailand, 20:1851 (IA;TH;In Thai)
Determination of ash content in lignite using gamma-ray transmission technique, 20:1309 (IA;TH;In Thai)
Determination of ash content in lignite using X-ray backscattering technique, 20:1310 (IA;TH;In Thai)
Development of a simple beam monitor at FNRF, 20:1634 (IA;TH)
Digital area monitor, 20:1632 (IA;TH;In Thai)
Effects of gamma radiation on fruit fly, Dacus zonatus (Saunders), 20:1901 (IA;TH;In Thai)
Enhancement of peak searching capability in nuclear spectrometry, 20:2540 (IA;TH;In Thai)
Low-cost nuclear technique for lignite ash determination, 20:1305 (IA;TH;In Thai)
New continuous analysis for radio-release technique, 20:1307 (IA;TH;In Thai)
Nondestructive neutron activation analysis of basalts, 20:1332 (R;TH;In Thai)
Optimized nuclear techniques and survey of neonatal chemical hypothyroidism in iodine deficient areas in Thailand - a preliminary report, 20:1881 (IA;TH)
Proceedings of the 3. nuclear science and technology conference, 20:1380 (I;TH;In English, Thai)
Property improvement by gamma polymerization of methyl methacrylate impregnated local Thai wood Yang (Dipterocarpus Sp.), 20:1251 (IA;TH;In Thai)
Radiation monitor calibration technique, 20:585 (IA;TH;In Thai)
Radiation vulcanization of natural rubber latex using N-butyl acrylate and carbon tetrachloride as sensitizer, 20:582 (IA;TH;In Thai)
Radiochemical control of disida kit, 20:1416 (IA;TH;In Thai)
Radionuclide migration from shallow land disposal site, 20:1800 (IA;TH;In Thai)
Sensory evaluation of irradiated and non-irradiated mungbean during storage, 20:1902 (IA;TH;In Thai)
Software program for a study and calculation of radiation, 20:2541 (IA;TH;In Thai)
Some studies on extractive liquid scintillation counting for Th-234/P-234m, 20:1308 (IA;TH;In Thai)
Spectrophotometric determination of inactive molybdenum in sodium pertechnetate (technetium-99m) for injection, 20:1311 (IA;TH;In Thai)
Standardization in beta dosimetry, 20:584 (IA;TH;In Thai)
Study on alpha-spectrometry of transuranic elements in environmental samples, 20:1312 (IA;TH;In Thai)
The effects of gamma irradiation on blood and its components, 20:1899 (IA;TH)
The production of thermoluminescence dosemeter, $CaSO_4$(Dy), 20:1633 (IA;TH;In Thai)
The study of irradiated fish for prevention, 20:1903 (IA;TH)
The use of Au-198 in evaluation of current efficiency in commercial aluminium reduction cell, 20:583 (IA;TH;In Thai)
The use of environmental isotopes in ground water hydrology studies in Thailand, 20:1900 (IA;TH;In Thai)
Thermal neutron capture gamma ray analysis with NaI(Tl) detector, 20:610 (IA;TH;In Thai)
TSH IRMA of dried blood spots, 20:1882 (IA;TH;In Thai)

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Improved die castings through plasma surface modification, improved sensors and die soldering prevention: Quarterly progress report 1, July 1–September 30, 1994, 20:1112 (R;US)

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Geothermal direct-heat utilization assistance: Quarterly project progress report, July 1994–September 1994, 20:716 (R;US)

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The use of flow zytometry for microbiological analysis and assessing the performance of aerobic and anaerobic sewage works with the aim of biological process optimisation and control: Final report, 20:621 (R;DE;In German)

Oslo Univ. (Norway). Fysisk Inst.
Asymmetric nuclear matter and neutron star properties, 20:2223 (R;NO)
Precision determination of the Z^o resonance parameters, 20:1655 (R;NO)
Section for nuclear physics and energy physics - Annual report: January 1 - December 31, 1993, 20:2517 (R;NO)
Spin dependent pre-equilibrium formation in the $^{163}Dy(^3He,\alpha)$ reaction, 20:2274 (R;NO)

Oulu Univ. (Finland). Dept. of Theoretical Physics
Nuclear matter equation of state with effects of excluded volume., 20:2218 (R;UA)

P

Pacific Northwest Lab., Richland, WA (United States)
1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan, 20:297 (R;US)
A mathematical model of the temperature and current distributions in a deep stratified reservoir, 20:633 (R;US)
Airborne Multisensor Pod System (AMPS) data access concept, 20:970 (R;US)
Analytical characterization of high-level mixed wastes using multiple sample preparation treatments, 20:1333 (R;US)
Autoradiographic studies of ^{65}Zn adsorption by periphyton, 20:1908 (R;US)
Characterization and monitoring of 300 Area Facility liquid waste streams: Status report, 20:305 (R;US)
Cooperative study of clinical benefits from use of the fully portable blood irradiator, 20:932 (R;US)
Data quality objectives process applied to characterization of Hanford tanks containing ferrocyanide, 20:310 (R;US)
Designing an enhanced groundwater sample collection system, 20:1831 (R;US)
Diel and seasonal white sturgeon (Acipenser transmontanus) movements in relation to Columbia River temperatures, 20:838 (R;US)
Dual shell pressure balanced reactor vessel: Final project report, 20:304 (R;US)
Eielson Air Force Base operable unit 2 and other areas record of decision, 20:1829 (R;US)
Exploratory studies of the interactions of gas supersaturation and temperature on mortality of juvenile salmonids, 20:637 (R;US)
Factors affecting the quality of fish caught by Native Americans in the Zone 6 fishery 1991 through 1993, 20:1858 (R;US)
Flammable gas safety program: Analytical methods development: FY 1994 progress report, 20:302 (R;US)
Hanford Site ground-water monitoring for 1993, 20:466 (R;US)
Hanford Site National Environmental Policy Act (NEPA) characterization: Revision 6, 20:579 (R;US)
Hanford technology integration: A success story, 20:933 (R;US)
Hydrogeology along the southern boundary of the Hanford Site between the Yakima and Columbia Rivers, Washington, 20:1830 (R;US)
Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method, 20:509 (R;US)
Integrated demonstrations, integrated programs, and special programs within DOE's Office of Technology Development, 20:922 (R;US)
Manipulation of natural subsurface processes: Field research and validation: Interim report, 20:510 (R;US)
New distribution records and notes on the life history and behavior of the sand roller, Percopsis transmontana (Eigenmann and Eigenmann), 20:835 (R;US)
Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers, 20:639 (R;US)
Pacific Northwest Laboratory annual report for 1993 to the DOE Office of Energy Research: Part 4: Physical sciences, 20:1941 (R;US)
Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993, 20:298 (R;US)
Phase I ResonantSonic CRADA report, 20:1496 (R;US)
Progress report on O2 research and development Mission 14: Columbia River studies, July–December 1966, 20:834 (R;US)
Public values related to decisions in the Tank Waste Remediation System Program, 20:301 (R;US)
Radiochemistry methods in DOE methods for evaluating environmental and waste management samples, 20:1334 (R;US)
Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)
Source evaluation report phase 2 investigation: Limited field investigation: Final report: United States Air Force Environmental Restoration Program, Eielson Air Force Base, Alaska, 20:1828 (R;US)
Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system, 20:307 (R;US)
Tank characterization report for Single-Shell Tank B-111, 20:299 (R;US)
Tank characterization report for Single-Shell Tank T-102, 20:300 (R;US)
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)
Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)
Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994), 20:308 (R;US)
Waste Tank Organic Safety Program: Analytical methods development: Progress report, FY 1994, 20:303 (R;US)
Whole-building energy targets "A" prototype, initial version, 20:1031 (R;US)

Paderborn Univ. (Gesamthochschule) (Germany). Lab. fuer Waerme- und Kaeltetechnik
DKV joint project: reduction of CFC-emissions in air conditioning and refrigeration. Subproject 6: Pool boiling of new refrigerants and their mixtures at single plain and finned tubes. Final report, 20:1473 (R;DE;In German)

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Production and lifetime measurements for B_s^0 with the LEP DELPHI detector, 20:2196 (R;FR;In French)

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Δ decay and absorption in nuclei, 20:2161 (R;FR)
$\pi\pi$ and KK-bar channel coupling. Pt. 2: The $f_0(975)$ meson and KK-bar threshold effects, 20:2193 (R;FR)
$^{29}Si(d,^3He)^{28}Al$ reaction at 29 MeV, 20:2250 (R;FR)
A possible experimental determination of m_e/m-circumflex from $K_{\mu 4}$ decays, 20:2194 (R;FR)
Blocking effect in the $16^+ \rightarrow 16^+$ (p,t) transition on the isomeric $^{178}Hf^{m2}$ target, 20:2244 (R;FR)
Bubble nucleation rates in first-order phase transitions, 20:2020 (R;FR)
Coding chaotic billiards. Pt. 2: Compact billiards tiling the pseudosphere, 20:1994 (R;FR)
Coding chaotic billiards. Pt. 3: Non-tiling billiards defined on the pseudosphere, 20:1995 (R;FR)
Discrete symmetries in the Weyl expansion for quantum billiards, 20:1998 (R;FR)
Effective Lagrangian with vector mesons: Linear response theory, 20:2164 (R;FR)
Equation of state of an anyon gas in a strong magnetic field, 20:2021 (R;FR)
Exclusive and restricted inclusive reactions involving the ^{11}Be one-neutron halo, 20:2248 (R;FR)
Exclusive measurements of Δ excitation by the $(^3He,t)$ reaction, 20:2249 (R;FR)
Finite population-size effects in projection Monte Carlo methods, 20:1997 (R;FR)
Ground state properties and glueball spectrum in SU(2) Yang-Mills theory using gauge invariant variables, 20:2093 (R;FR)
Hadronic physics with multi-GeV electrons, 20:2214 (R;FR)
Hadronization in nuclear matter, 20:2243 (R;FR)

Inelastic leptoproduction of J/ψ, 20:2162 (R;FR)
Light quark masses from exclusive tau decays: An experimental proposal, 20:2195 (R;FR)
Many-body methods at finite temperature, 20:2213 (R;FR)
Moments of inertia and the shapes of Brownian paths, 20:2022 (R;FR)
Multiphonon excitations in nuclei built with giant resonances, 20:2211 (R;FR)
New fission fragments discovered in collisions of relativistic ^{238}U ions with Pb target nuclei, 20:2251 (R;FR)
Non-linear sputtering effects induced by MeV energy gold clusters, 20:2359 (R;FR)
On δ perturbative interactions in the Aharonov-Bohm and Anyon models, 20:1996 (R;FR)
On the capabilities of present radioactive beam facilities, 20:1520 (R;FR)
On the coherence between high-energy total cross-section data when compared with general principles, 20:2165 (R;FR)
On the spectral density of Euclidean Dirac operator in QCD, 20:2091 (R;FR)
Orbital magnetism in ensembles of ballistic billiards, 20:2024 (R;FR)
Partitioning of unstructured meshes for load balancing, 20:2542 (R;FR)
Quantum prewetting transitions in liquid ^{3}He, 20:2396 (R;FR)
Realistic microscopic level densities for spherical nuclei, 20:2216 (R;FR)
Relativistic effects in the scalar meson dynamics, 20:2163 (R;FR)
Separation and implantation of relativistic ^{86}Kr-fragments at the FRS: Half-life measurement by ion-β time-correlations, 20:2246 (R;FR)
Shell structure in faceted metal clusters, 20:2363 (R;FR)
Spectroscopic factors from one-proton stripping reactions on sd-shell nuclei: Experimental measurements and shell model calculations, 20:2245 (R;FR)
Statistical and direct decay of high-lying single-particle excitations, 20:2210 (R;FR)
Statistical properties of the zeros of zeta functions - beyond the Riemann case, 20:1993 (R;FR)
Strong Coulomb coupling in relativistic quantum constraint dynamics, 20:2092 (R;FR)
Superdeformed rotational bands in the Mercury region: A cranked Skyrme-Hartree-Fock-Bogoliubov study, 20:2215 (R;FR)
The giant dipole resonance built on highly excited states: Results of the MEDEA experiment, 20:2209 (R;FR)
The no-hair conjecture in 2D dilaton supergravity, 20:2090 (R;FR)
The reaction $\gamma\gamma \rightarrow \pi^0\pi^0$ in generalized chiral perturbation theory, 20:2166 (R;FR)
The two-fermion relativistic wave equations of Constraint Theory in the Pauli-Schroedinger form, 20:2053 (R;FR)
Thermal behaviour analysis of SRF cavities and superconducting HOM couplers: Numerical simulation and experimental results, 20:1554 (R;FR)
Total d+d $\rightarrow \alpha+\eta$ cross sections near threshold, 20:2252 (R;FR)
Towards limiting temperatures in nuclei: The behaviour of collective motion, 20:2212 (R;FR)
Trace formula for Riemann surfaces with magnetic field, 20:1992 (R;FR)
Transmutation of nuclear wastes: A working report to Nupecc, 20:284 (R;FR)
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Higgs boson search at a 500 GeV e^+e^- collider, 20:2176 (R;FR)
Production and lifetime measurements for B_s^0 with the LEP DELPHI detector, 20:2196 (R;FR;In French)
VAXNEWS version 3.12: User manual, 20:2548 (R;FR)
VAXNEWS version 3.12: Management manual, 20:2549 (R;FR)

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Determination of ^{90}Sr in grass and soil, 20:1335 (R;CH)
Grimsel test site: preparation and performance of migration experiments with radioisotopes of sodium, strontium and iodine, 20:1832 (R;CH)
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D-T radiation effects on TFTR diagnostics, 20:2420 (R;US)
Fusion power production in TFTR, 20:2444 (R;US)
Heating and transport in TFTR D-T plasmas, 20:2417 (R;US)
ICRF heating of deuterium-tritium plasmas in TFTR, 20:2422 (R;US)
ICRF-induced DD fusion product losses in TFTR, 20:2419 (R;US)
The simulation of hard x-ray images obtained during lower hybrid current drive on PBX-M, 20:2421 (R;US)
Toxic Chemical System (TCS), 20:1368 (R;US)

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Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)

Q

Quantics, Inc., Exton, PA (United States)
Prototype integration of the joint munitions assessment and planning model with the OSD threat methodology, 20:1678 (R;US)

R

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G-banding analysis of radiation-induced chromosome damage in lymphocytes of Hiroshima atomic-bomb survivors, 20:1943 (R;JP)

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US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1, 20:241 (R;US)
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Ultrafast optical studies of surface reaction processes at semiconductor interfaces: Progress report, 20:682 (R;US)

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BCE selector valves and flow proportional sampler, 20:1658 (R;US)

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A process for establishing a financial assurance plan for LLW disposal facilities, 20:237 (R;US)

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A technique for calculating the field aligned conductance and ionospheric Pedersen conductivity from high altitude electric and magnetic field data, 20:2425 (R;SE)
Multicomponent double layers and selective acceleration of charged particles, 20:2424 (R;SE)
Plasma characteristics determined by the Freja electric field instrument, 20:2426 (R;SE)

Ruhrkohle AG, Essen (Germany)
Development of an optics-based method for reducing mine-stone content of run-of-mine coal: Final report, 20:72 (I;DE;In German)

Ruhrkohle AG, Herne (Germany)
Design, construction and testing of a rotary kiln for the thermal treatment of contaminated soils: Final report, 20:129 (I;DE;In German)

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Joint project 'Mining': Transport and assembly aids underground: Final report, 20:74 (I;DE;In German)

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Reduction of health-affecting ultra-fine dusts by automatically controlled water addition during the application of dry construction materials. Main phase: Final report, 20:77 (I;DE;In German)

S

Sandia Labs., Livermore, CA (United States)
CHEMKIN2: General Gas-Phase Chemical Kinetics, 20:2538 (CM;US)

Sandia National Labs., Albuquerque, NM (United States)
A comparison of phase change phenomena in CTH with experimental data, 20:1682 (R;US)
A field test and evaluation of exterior fiber optic intrusion detection sensors, 20:1446 (R;US)
A Hypervelocity Experimental Research Database (HERD): Support for the Wright Laboratory Armament Directorate Code Validation Program (COVAL), 20:1698 (R;US)
A review of technology for contact protection of remediation manipulators (WHC Issue 39), 20:513 (R;US)
A Sandia National Laboratories decontamination and demolition success story, 20:514 (R;US)
A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores, 20:2556 (R;US)
Advanced robotic technologies for transfer at Sandia National Laboratories, 20:1448 (R;US)
An evaluation of the fire barrier system thermo-lag 330-1, 20:812 (R;US)
An object-oriented implementation of the Xpress Transfer Protocol, 20:2559 (R;US)
An overview: Component development for solar thermal systems, 20:708 (R;US)
Analysis of experimentally shocked minerals by NMR spectroscopy, 20:1285 (R;US)
Applications for reactor-pumped lasers, 20:1508 (R;US)
Assembly partitioning with a constant number of translations, 20:1447 (R;US)
Characteristics and development report for the MC3994 and MC3994A relays, 20:1504 (R;US)
Characteristics of special-case wastes potentially destined for disposal at the Nevada Test Site, 20:316 (R;US)
Characterization and electrical properties of copper films grown via direct liquid coinjection of (hfac)Cu(TMVS) and TMVS, 20:1163 (R;US)
Characterization of ignition overpressure using band limited temporal moments, 20:1683 (R;US)
Complementary GaAs junction-gated heterostructure field effect transistor technology, 20:1505 (R;US)
Complementary GaAs junction-gated heterostructure field effect transistor fabrication for integrated circuits, 20:2307 (R;US)
Computational design of hypervelocity launchers, 20:1444 (R;US)
Correlations for the OH $A^2\Sigma^+(v'=0)$ electronic quenching cross-section, 20:1424 (R;US)
COYOTE II - a finite element computer program for nonlinear heat conduction problems: Part I - theoretical background, 20:1477 (R;US)
CTH analyses of steel rod penetration into aluminum and concrete targets with comparisons to experimental data, 20:2026 (R;US)
Damage detection and health monitoring of operational structures, 20:1445 (R;US)

Defect production and recombination during low-energy ion processing, 20:1286 (R;US)
Determining information management needs for enhanced international safeguards, 20:558 (R;US)
Development of a tester for evaluation of prototype thermal cells and batteries, 20:1674 (R;US)
Development of concentrator solar cells, 20:691 (R;US)
Development status of an intense beam klystron, 20:1509 (R;US)
Effect of neutron irradiation on the impact properties of A533B steel, 20:1162 (R;US)
Electromagnetic scattering from buried objects, 20:1685 (R;US)
Evaluation of fine-particle catalysts: Activity testing results and phase identification using Mossbauer spectroscopy, 20:52 (R;US)
Experimental and numerical investigation of shock-induced full vaporization of zinc, 20:1681 (R;US)
Experimental investigation of the wake behind a solid disk, 20:1680 (R;US)
Geomechanics of horizontally-drilled, stress-sensitive, naturally-fractured reservoirs, 20:123 (R;US)
Gunfire characterization and simulation using temporal moments, 20:1684 (R;US)
High frequency current sensors using the Faraday effect in optical fibers, 20:1669 (R;US)
Highlights of recent balance of system research and evaluation, 20:694 (R;US)
Historical sketches of Sandia National Laboratories nuclear field testing: Volume 1: Full discussion except for sensitive references, 20:1695 (R;US)
Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material, 20:1425 (R;US)
Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994, 20:189 (R;US)
Issues in the flight qualification of a space power reactor, 20:793 (R;US)
Laboratory investigation of constitutive property scaling behavior, 20:105 (R;US)
Laser materials processing at Sandia National Laboratories, 20:1164 (R;US)
Lidar technologies for airborne and space-based applications, 20:1666 (R;US)
Light shaping diffusers™ improve aircraft inspection, 20:1033 (R;US)
MELTER: A model of the thermal response of cargos transported in the Safe-Secure Trailer subject to fire environments for risk assessment applications, 20:208 (R;US)
Missile sizing for ascent-phase intercept, 20:1699 (R;US)
New developments in high average power short-pulse induction accelerators for industrial and environmental applications, 20:1525 (R;US)
Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants, 20:317 (R;US)
Plasma-induced-damage of GaAs during etching of refractory metal contacts, 20:1287 (R;US)
Prosperity Games prototyping with the American Electronics Association, March 8–9, 1994, 20:1050 (R;US)
Reactor pumped laser research at the Sandia National Laboratories pulsed reactor facilities, 20:1506 (R;US)
Real-time dynamic simulator for the Topaz II reactor power system, 20:792 (R;US)
Recent National Solar Thermal Test Facility activities, in partnership with industry, 20:702 (R;US)
Recent reflux receiver developments under the US DOE program, 20:707 (R;US)
Reciprocal space mapping of epitaxial materials using position-sensitive x-ray detection, 20:1673 (R;US)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)
Research on U.S. nuclear power plant major equipment aging, 20:883 (R;US)
Risk impact of BWR technical specifications requirements during shutdown, 20:880 (R;US)
Safeguards equipment of the future integrated monitoring systems and remote monitoring, 20:560 (R;US)
Si concentrator solar cell development: [Final report], 20:692 (R;US)
Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs, 20:1507 (R;US)
SPINFIN: A computer program for trajectory simulation of flight vehicles with semi-passive roll control systems, 20:1686 (R;US)
Stiffness and strength properties of natural fractures from north ramp drill holes, 20:467 (R;US)
Synthetic aperture radar processing with polar formatted subapertures, 20:1667 (R;US)
Technologies for highly parallel optoelectronic integrated circuits, 20:2557 (R;US)
Test interference calculations for the Yucca Mountain Project ESF thermomechanical experiments: Yucca Mountain Site Characterization Project, 20:314 (R;US)
Testing of the SAIC facets on the stretched-membrane dish, 20:706 (R;US)
The International Remote Monitoring Project and implications, 20:561 (R;US)
The numerical integration and 3-D finite element formulation of a viscoelastic model of glass, 20:1288 (R;US)
The U.S. Department of Energy's role in commercialization of solar thermal electric technology, 20:701 (R;US)
Thermal design of the fast-on-orbit recording of transient events (FORTE) satellite, 20:1696 (R;US)
Thermodynamic modeling of neptunium(V) solubility in concentrated $Na-CO_3-HCO_3-Cl-ClO_4-H-OH-H_2O$ systems, 20:315 (R;US)
Thin flexible intercalation anodes, 20:899 (R;US)
Tonopah Test Range EGS graphics tracking display system: HP370, 20:1697 (R;US)
Top ten list of user-hostile interface design, 20:2558 (R;US)
Tungsten-uranium penetrator target interaction, 20:1156 (R;US)
Unlimited-bandwidth distributed optical phase modulators and detectors: Design and fabrication issues, 20:1668 (R;US)
US House of Representatives Committee on Energy and Commerce Subcommittee on Energy and Power, 20:934 (R;US)
Using Process Quality Management Improvement (PQMI) to develop business processes and procedures, 20:935 (R;US)
Very high-power electron-beam transport in long gas cells from 10^{-3} to 10^{3} Torr N_2, 20:1592 (R;US)
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Electrical simulation and analysis of large complex electrical systems, 20:884 (R;US)
Enhancements in the Livermore spectrum analysis package PIXEF, 20:2341 (R;US)
Partnering with Sandia National Laboratories through alliances or consortia, 20:936 (R;US)
Piercing tool, Transportation Accident Resistant Container (TARC), 20:1449 (R;US)
Roll control resonance test vehicle (RCRTV) system postflight evaluation report, 20:1034 (R;US)
Steamboat Hills exploratory slimhole: Drilling and testing, 20:712 (R;US)
Temporal evolution of turbulence/chemistry interactions in lifted, turbulent-jet flames, 20:1426 (R;US)
The permeation of bis(2-fluoro-2,2-dinitroethyl) formal (FEFO), ethyl 4,4-dinitropentanoate (EDNP), ethyl 4-nitropentanoate (ENP), and 1,2,4-trichlorobenzene (TCB) through barrier membranes, 20:1688 (R;US)
Thermal decomposition reactions of HMX and RDX and their importance in predicting cookoff hazards, 20:1689 (R;US)

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The effect of proteins on the aging properties of radiation vulcanized natural rubber latex, 20:1381 (I;PH)

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Risk impact of BWR technical specifications requirements during shutdown, 20:880 (R;US)

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Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1, 20:478 (R;US)
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Future directions for arms control and nonproliferation: Conference summary, 20:1097 (R;US)

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Monthly results of measurements; April 1994, 20:1834 (R;FR;In French)
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Energy policy goals: Energy concept for Hanover. Module 1, 20:978 (I;DE;In German)

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A preliminary, precise measurement of the average B hadron lifetime, 20:2181 (R;US)
Algorithms for orbit control on SPEAR, 20:1608 (R;US)
Broad-band, multi-kilowatt, vacuum, HOM waveguide loads for the PEP-II RF cavity, 20:1613 (R;US)
High-power RF window design for the PEP-II B Factory, 20:1614 (R;US)
Measurement of the average lifeetime of B hadrons at SLD, 20:2199 (R;US)
Mode selective directional coupler for NLC, 20:1595 (R;US)
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Operation and performance of a longitudinal damping system using parallel digital signal processing, 20:1612 (R;US)
Performance of the SLD CCD pixel vertex detector and design of an upgrade, 20:1656 (R;US)
Polarization of charmonium in πN collisions, 20:2182 (R;US)
Prospects for high power Linac Coherent Light Source (LCLS) development in the 1000Å – 1Å wavelength range, 20:1526 (R;US)
RF Feedback Analysis for 4 cavities per klystron in PEP-II, 20:1611 (R;US)
RF feedback simulation for the PEP-II B Factory, 20:1593 (R;US)

RF system design for the PEP-II B Factory, 20:1610 (R;US)
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Impedance measurements of the LEB extraction kicker magnet, 20:1600 (R;US)
The 12-GeV/c beam transfer and absorber lines for the Superconducting Super Collider, 20:1540 (R;US)

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Direct fault dating trials at the Aespoe Hard Rock Laboratory, 20:1836 (R;SE)
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Investigation of different rotor blade forms of wind power plants by means of quasi-steady wind tunnel tests, 20:722 (R;DE;In German)

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Early detection of failures in internal combustion engines by analysing the angular velocity at the crankshaft, 20:1066 (I;DE;In German)
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Measurement of the structure function F_2 of the proton in deep inelastic e-p scattering with the H1 detector at the HERA storage ring, 20:2179 (R;DE;In German)

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Scale-up of mild gasification to a process development unit, 20:8 (R;US)
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105KE and 105KW Basins fuel and sludge consolidation study, summary report, 20:347 (R;US)
1993 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site, 20:247 (R;US)
1994 Solid waste forecast summary: Waste characteristics and treatability groups, 20:327 (R;US)
241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:369 (R;US)
241-AV/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:371 (R;US)
241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1, 20:370 (R;US)
241-SY-101 air lance removal lessons learned, 20:531 (R;US)
242-A Campaign 94-1 post run document, 20:404 (R;US)
242-A Evaporator waste analysis plan: Revision 4, 20:401 (R;US)
242-A Evaporator/Liquid Effluent Retention Facility data quality objectives, 20:383 (R;US)
300 Area treated effluent disposal facility operating specifications document, 20:1860 (R;US)
308 Building electrical load list and panel schedules, 20:886 (R;US)
616 Nonradioactive Dangerous Waste Storage Facility – Essential/support drawing list: Revision 2, 20:414 (R;US)
95-1 Campaign evaporator boildown results, 20:382 (R;US)
A quality control program for waste disposal vault closure, 20:334 (R;US)
A summary description of the flammable gas tank safety program, 20:411 (R;US)
A team leadership approach to managing the transition from construction to operations for an environmental project, 20:521 (R;US)
Accelerated clean-up at the Hanford Site, 20:520 (R;US)
Acceptance test procedure for Project W-049H, 20:357 (R;US)
Acceptance test procedure, 241-SY-101/241-C-106 shot loading system, 20:374 (R;US)
Acceptance test report for 241-AW process air system, 20:375 (R;US)
Advanced reactors transition fiscal year 1995 multi-year program plan WBS 7.3, 20:870 (R;US)
Advances in technology transfer at Federal Facilities, 20:937 (R;US)
Aerosol can puncture device operational test plan, 20:356 (R;US)
Analytical services FY 1995 multi-year program plan fiscal year work plan, WBS 1.5.1, 20:214 (R;US)
Anti-foam System design description, 20:412 (R;US)
Automated Transportation Management System (ATMS) user's manual: Revision 1, 20:209 (R;US)
B Plant cleanout and stabilization program update, 20:532 (R;US)
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
B Plant low level waste system integrity assessment plan, 20:425 (R;US)
B Plant retired HEPA filters engineering study (Project W-059), 20:358 (R;US)
B Plant: WESF location study, 20:530 (R;US)
Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Budget FY 1995 site support program plan WBS 6.10.1, 20:2519 (R;US)
CEL Working procedures for WRAP 2A formulation development test, 20:362 (R;US)
Clean Salt integrated flowsheet, 20:384 (R;US)
Cleanup MAC and MBA code ATP, 20:2566 (R;US)
Combining innovative technology demonstrations with dense non-aqueous phase liquids cleanup, 20:1843 (R;US)
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
Conceptual design analyses for Hanford Site deployable remote spectroscopy systems, 20:413 (R;US)
Conversion to Paradox 4.02 ATP's for MAC and mass balance programs, 20:564 (R;US)
Core sample truck improvement test report, 20:422 (R;US)
Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)
Critically safety evaluation for K Basins sandfilters, 20:344 (R;US)
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground, 20:351 (R;US)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Engineering drawing field verification program: Revision 3, 20:423 (R;US)
Engineering task plan for steam line ramp calculations, 20:399 (R;US)
Enhanced sludge washing evaluation plan, 20:328 (R;US)
Evaluation of FTIR-based analytical methods for the analysis of simulated wastes, 20:420 (R;US)
Evaluation of hydrogen buildup in radioactive mixed waste drums, 20:367 (R;US)
Evaluation of near-field earthquake effects, 20:1456 (R;US)
Facility effluent monitoring plan for the B plant, 20:324 (R;US)
Feasibility study for the processing of Hanford Site cesium and strontium isotopic sources in the Hanford Waste Vitrification Plant, 20:323 (R;US)
Feasibility study of tank leakage mitigation using subsurface barriers, 20:529 (R;US)
Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout, 20:329 (R;US)
Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II, 20:326 (R;US)
Financial services FY 1995 site support program plan WBS 6.10.4, 20:2518 (R;US)
Fire protection program fiscal year 1995 site support program plan, Hanford Fire Department, 20:535 (R;US)
Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1), 20:402 (R;US)
Gamma irradiation test report of simulated grout specimens for gas generation/liquid advection, 20:410 (R;US)
Geologic setting of the low-level burial grounds, 20:340 (R;US)
Glass science tutorial: Lecture #1, Chemistry and properties of oxide glasses, 20:1290 (R;US)
Glass science tutorial: Lecture #2, Operating electric glass melters, 20:331 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)

Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994, 20:339 (R;US)
Hanford Generic Interim Safety Basis, 20:341 (R;US)
Hazard assessments of double-shell flammable gas tanks, 20:533 (R;US)
Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site, 20:469 (R;US)
Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances, 20:332 (R;US)
In situ sampling device development engineering task plan, 20:398 (R;US)
Interim data quality objectives for waste pretreatment and vitrification: Revision 1, 20:528 (R;US)
K-West and K-East basin thermal analyses for dry conditions, 20:346 (R;US)
KE Basin water dispositioning engineering study, 20:470 (R;US)
LABCORE post release 1.0 development system project management plan, 20:406 (R;US)
Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)
Liquid effluent/Hanford Environmental compliance FY 1995 Multi-Year Program Plan/Fiscal Year Work Plan, WBS 1.2.2.1 and 1.2.2.2, 20:428 (R;US)
Load test of the 272E Building high bay roof deck and support structure, 20:523 (R;US)
Load test of the 3701D Building roof deck and support structure, 20:524 (R;US)
Load test of the 3790 Building Roof Deck and Support Structure, 20:525 (R;US)
Low level tank waste disposal study, 20:368 (R;US)
Low-level waste certification plan for the WSCF Laboratory Complex, 20:335 (R;US)
Low-level waste characterization plan for the WSCF Laboratory Complex, 20:336 (R;US)
Low-level waste vitrification plant environmental permitting plan, 20:405 (R;US)
MBA acceptance test procedures, software Version 1.4, 20:566 (R;US)
Nondestructive examination development and demonstration plan, 20:355 (R;US)
One-trip drum operating instruction, 20:352 (R;US)
Operability test report for the 300 Area Treated Effluent Disposal Facility, 20:343 (R;US)
Paradox applications integration ATP's for MAC and mass balance programs, 20:565 (R;US)
Phase I ResonantSonic CRADA report, 20:1496 (R;US)
Phase III (full scale) agitated mixing test plan, 20:363 (R;US)
Planning integration FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP), 20:213 (R;US)
Plutonium and tritium produced in the Hanford Site production reactors, 20:563 (R;US)
Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility, 20:365 (R;US)
Project L-070, "300 Area process sewer piping system upgrade" Project Management Plan, 20:1771 (R;US)
Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1, 20:353 (R;US)
Project W-320 Heel Jet Secondary Catch Mechanism lateral load test, 20:1458 (R;US)
PUREX irradiated fuel recovery simulation, 20:186 (R;US)
Quality assurance program plan for low-level waste at the WSCF Laboratory, 20:337 (R;US)
Radioisotope Thermoelectric Generator Package O-Ring Seal Material Validation Testing, 20:1005 (R;US)
Radiological containment selection, design, and specification guide, 20:381 (R;US)
Radiological control FY 1995 site support program plan WBS 6.7.2.4, 20:536 (R;US)
Radiological design guide, 20:1455 (R;US)
Radon discrimination for work place air samples, 20:471 (R;US)
Remote automated material handling of radioactive waste containers, 20:333 (R;US)
Research of documents pertaining to waste migration from leaking single-shell tanks, 20:472 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary, 20:518 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report, 20:519 (R;US)
Safety assessment of discharge chute isolation barrier preparation and installation: Revision 1, 20:526 (R;US)
SASSI system software configuration, 20:1454 (R;US)
Seismic qualification of ventilation stack, 20:1453 (R;US)
Significant volume reduction of tank waste by selective crystallization: 1994 Annual report, 20:416 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2520 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2521 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2522 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:537 (R;US)
Sludge Stabilization Campaign blend plan, 20:338 (R;US)
Small job development software project documentation for the activity management system: Revision 1, 20:342 (R;US)
Software quality assurance plan for viscometer, 20:407 (R;US)
Software quality assurance plan for void fraction instrument, 20:408 (R;US)
Solid Waste Burial Grounds/Central Waste Complex hazards assessment, 20:345 (R;US)
Solid waste management complex site development plan, 20:364 (R;US)
Solid waste operations complex engineering verification program plan, 20:366 (R;US)
Special initiatives FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 5.0, 20:938 (R;US)
Standardized equipment labeling program for electrical utilities, 20:996 (R;US)
Statistical characterization report for Single-Shell Tank 241-T-107, 20:417 (R;US)
Stress analysis of core sampler truck number 2 platform: 2,000 LBF crane lift capacity, 20:1459 (R;US)
Structural analysis of color video camera installation on tank 241AW101 (2 Volumes), 20:380 (R;US)
Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)
Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm, 20:386 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm, 20:390 (R;US)
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm, 20:393 (R;US)
Synthetic waste chemical mechanism studies, 20:330 (R;US)
System configuration management plan for 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System, 20:377 (R;US)
System design description for mini-dacs data acquisition and control system, 20:1460 (R;US)
Tank 241-C-103 tank characterization plan, 20:421 (R;US)
Tank characterization reference guide, 20:418 (R;US)
Tank characterization report for double-shell Tank 241-AW-102, 20:394 (R;US)
Tank characterization report for double-shell Tank 241-AW-105, 20:395 (R;US)
Tank characterization report for Single-Shell Tank 241-T-107, 20:396 (R;US)

Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)
Tank Monitor and Control System sensor acceptance test procedure: Revision 5, 20:372 (R;US)
Tank Waste Remediation System decisions and risk assessment, 20:325 (R;US)
Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)
Test plan for core sampling drill bit temperature monitor, 20:534 (R;US)
Test procedure forms for sludge retrieval and packaging, 20:349 (R;US)
The history and legacy of Project X, 20:522 (R;US)
Transition projects FY 1995 multi-year program/fiscal year work plan WBS 1.3.1. and 7.1, 20:538 (R;US)
Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
TWRS corrosion monitoring program plan, 20:403 (R;US)
Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)
User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations, 20:190 (R;US)
Verification and validation of DEPOSITION 2.0, 20:1657 (R;US)
Void fraction instrument acceptance test procedure, 20:1676 (R;US)
Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)
Waste management plan for Hanford spent nuclear fuel characterization activities, 20:348 (R;US)
Waste Receiving and Packaging, Module 2A, Supplemental Design Requirements Document, 20:360 (R;US)
Waste Receiving and Processing Module 2A waste certification strategy, 20:361 (R;US)
Waste sampling and characterization facility (WSCF), 20:427 (R;US)
Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)
Work management administration FY 1995 site support program plan WBS 6.2, 20:2523 (R;US)
Work plan for 105KE Basin seal conveyor relocation, 20:350 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)
WRAP 2A advanced conceptual design report comments, 20:359 (R;US)

Westinghouse Savannah River Co., Aiken, SC (United States)
Analysis of welds on helium-containing restraint test plates, 20:813 (R;US)
Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)
Characterization of hazardous constituents in HLW supernate and implications for solid LLW generation, 20:437 (R;US)
Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification, 20:436 (R;US)
Decommissioning of facilities at the Savannah River Site, 20:540 (R;US)
Dimensionally stable metallic hydride composition, 20:615 (PA;US)
Drum investigation committee final report, 20:212 (R;US)
Experiences in the dry storage of aluminum-clad spent nuclear fuels, 20:210 (R;US)
F-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:440 (R;US)
H-area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:432 (R;US)
H-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:441 (R;US)
H-Area, K-Area, and Par Pond Sewage Sludge Application Sites groundwater monitoring report: Second quarter 1994, 20:439 (R;US)
High level waste characterization in support of low level waste certification: I. HLW supernate radionuclide characterization, 20:435 (R;US)
High level waste tank farm solid waste radionuclide smear sample and analysis plan, 20:438 (R;US)
Hydrologic budget for A/M Area, Savannah River Site, 20:477 (R;US)
K-Area acid/caustic basin groundwater monitoring report: First quarter 1994, 20:433 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report – Fourth quarter 1993 and 1993 summary: Volume 2, 20:474 (R;US)
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
Mercury in shallow Savannah River Plant soil, 20:253 (R;US)
Mercury migration into ground water, a literature study, 20:1778 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994, 20:475 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
Method for treating materials for solidification, 20:296 (PA;US)
P-Area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:434 (R;US)
Preliminary site characterization - final report, 20:442 (R;US)
Savannah River Site Environmental Monitoring Plan: Volume 1, Section 1000 Addendum: Revision 3, 20:473 (R;US)
Selection of melter systems for the DOE/Industrial Center for Waste Vitrification Research, 20:431 (R;US)
Spectrophotometric probe, 20:1672 (PA;US)
The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)
The Savannah River Site's groundwater monitoring program: First quarter 1994, 20:458 (R;US)
Tritium pumps which once contained mercury meet the RCRA definition of "empty container", 20:430 (R;US)
Unknown plant de-construction hazard – Toxic COS and CS_2 gas from torch cutting of pipe, 20:613 (R;US)
Uranium geochemistry in soil and groundwater at the F and H seepage basins, 20:271 (R;US)
Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G, 20:543 (R;US)
Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)

Wisconsin Univ., Milwaukee, WI (United States)
Magnetic x-ray circular dichroism in spin-polarized photoelectron diffraction, 20:2342 (R;US)

Y

Yakima Indian Nation, Toppenish, WA (United States)
Lower Yakima Valley Wetlands and Riparian Restoration Project: Final environmental assessment, 20:638 (R;US)

Yale Univ., New Haven, CT (United States)
[Model catalyst studies of active sites and metal-support interactions on vanadia and vanadia-supported catalysts], 20:1341 (R;US)
[Model catalyst studies of active sites and meta L support interactions on vanadia and vanadia-supported catalysts], 20:1342 (R;US)

Yale Univ., New Haven, CT (United States). Dept. of Computer Science
Functional & para-functional parallel processing, 20:2534 (R;US)
Research in functional programming on multiprocessor architectures: Final report, 20:2535 (R;US)

Yale Univ., New Haven, CT (United States). Dept. of Geology and Geophysics
Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)

Personal Author Index

Authors' surnames are indexed in the form appearing in the publication cited; given names generally have been reduced to initials. For documents with multiple authors, each author name is indexed. The entry for a primary author (first author listed on an abstracted document) includes the full document title and citation number. Entries for other authors provide a cross-reference to the primary author. Also included is information on the document type, country of publication, and the document language listed in parentheses in the format (J;FR;In French and English). Accent marks are not input because of computer alphabetization. Spelling and transliteration follow standard conventions.

A

Aagaard, H.C., Combined heat pump and solar heating system for villas: Phase 1, 20:700 (R;DK;In Danish)

Abad, L.V., The effect of proteins on the aging properties of radiation vulcanized natural rubber latex, 20:1381 (I;PH)

Abada, A., Effective Lagrangian with vector mesons: Linear response theory, 20:2164 (R;FR)

Abadir, M.F., *See* Elmasry, M.A.A., 20:1292

Abazov, V.M., Medical facility for radiation therapy with JINR proton phasotron beams, 20:1888 (R;XJ)

Abboud, R.G., *See* Reifman, J., 20:820

Abdel Fattah, N., *See* Souka, N., 20:159

Abdel Wahab, M.M., Estimation and analysis of spectral solar radiation over Cairo, 20:640 (R;XA)

Abdelazim, M.E., The metallurgy of superalloys part 1., 20:1101 (R;EG)

The metallurgy of superalloys part 2, 20:1102 (R;EG)

Abdelhalim, A.S., Quality control in nuclear fuel fabrication, 20:146 (R;EG)

Abdelrehim, F., *See* Souka, N., 20:1377

Abe, K., *See* Enomoto, R., 20:2172

Abe, Seiya, *See* Morii, Yasutsugu, 20:1565

Abe, T., *See* Enomoto, R., 20:2172

Abe, Toshinori, A study of single photon production with the TOPAZ detector, 20:2175 (RA;JP)

Abe, Yutaka, *See* Akimoto, Hajime, 20:765

Abegg, C., Thermal convection with phase change: Experimental investigations and comparison with numerical results, 20:1471 (I;DE;In German)

Abernethy, C.S., Factors affecting the quality of fish caught by Native Americans in the Zone 6 fishery 1991 through 1993, 20:1858 (R;US)

Abou Zahra, A.A., *See* Gadallah, A.A., 20:795

Adel, G., *See* Yoon, R.H., 20:5

Adewumi, M.A., Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994, 20:128 (R;US)

Adhikari, R., Scalar three body decays and signals for new physics, 20:2159 (R;XA)

Adkins, D.R., *See* Andraka, C.E., 20:707

Adkins, H.E., Radioisotope Thermoelectric Generator Package O-Ring Seal Material Validation Testing, 20:1005 (R;US)

Adler, H., *See* Hawryluk, R.J., 20:2443

See Taylor, G., 20:2422

Adzic, G.D., Composition and cycle life of multicomponent AB_5 hydride electrodes, 20:895 (R;US)

Adzic, R.R., *See* Ocko, B.M., 20:2309

Aeppli, A., Gauge invariance in off-shell W pair production, 20:2110 (RA;DE)

Afanas'ev, S.V., *See* Azhgirej, L.S., 20:2259

Ager, J.W. III, *See* Moll, A.J., 20:1284

Aggeryd, I., *See* Bergstroem, U., 20:1859

Agodi, C., *See* Le Faou, J.H., 20:2212

See Suomijaervi, T., 20:2209

Agren, G.I., *See* Ingestad, T., 20:1966

Aguilera, A., *See* Lheureux, R., 20:771

Ahmadi, G., A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994, 20:78 (R;US)

Ahmed, E.E., Reactor elements properties response during a postulated loss-of-coolant accident (LOCA), 20:804 (R;EG)

Ahrens, L.A., *See* van Asselt, W.K., 20:1543

Akau, R.L., Thermal design of the fast-on-orbit recording of transient events (FORTE) satellite, 20:1696 (R;US)

Akbari, H., *See* Fishman, B., 20:1822

See Kurn, D.M., 20:992

See Sezgen, A.O., 20:1020

Akemoto, Mitsuo, Development of an X-band klystron modulator using a pulse-forming line and magnetic switch, 20:1573 (RA;JP;In Japanese)

Akhundov, A., Model independent QED corrections to the process $ep \rightarrow eX$, 20:2158 (R;XA)

Akhundov, A.A., Radiative corrections for pion polarizability experiments, 20:2160 (R;XA)

Akiba, Mitsunori, Application to plutonium and uranium in safeguards, 20:554 (IA;JP;In Japanese)

Akimoto, Hajime, Improvement of pressure drop calculation model in TRAC-PF1 code, 20:765 (R;JP;In Japanese)

Akinlade, O., *See* Pastore, G., 20:1348

Akishin, P.G., On the numerical method for analysis of the dynamics of the classical Hamiltonian systems, 20:2543 (R;XJ)

Akiyama, Mitoshi, *See* Ito, Takashi, 20:1931

See Kyoizumi, Seishi, 20:1933

See Seyama, Toshio, 20:1932

Akre, J., *See* Hoyer, E., 20:1590, 20:1605

Aksenov, V.K., Particularities of copper structure state after low-temperature recrystallization, 20:1141 (IA;UA;In Russian)

Akyurtlu, A., Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1993–June 30, 1993, 20:65 (R;US)

Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:66 (R;US)

Al-Chalabi, R.M.K., *See* Turinsky, P.J., 20:801

Alamanos, N., *See* Le Faou, J.H., 20:2212

See Suomijaervi, T., 20:2209

Alarco, F.M., Spanish national programme and experience on training and qualification for nuclear power plant personnel, 20:2482 (RA;XA)

Alba, R., *See* Suomijaervi, T., 20:2209

Alberman, A., *See* Beretz, D., 20:756

Albersheim, P., The structures and functions of oligosaccharins, 20:1892 (R;US)

Alberts, W.G., New dose units in radiation protection, 20:1942 (R;DE;In German)

Albrecht, H., A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S), 20:2146 (R;DE)

Measurement of the decay fractions of D^* mesons, 20:2144 (R;DE)

Albright, J.N., *See* Rutledge, J.T., 20:122

Aldabe, F., Recoil effects in quantum topological solitons, 20:1987 (R;XA)

Alde, D., *See* Donskov, S.V., 20:1585

Aldridge, L.P., *See* Sabine, T.M., 20:2335

Aleksan, R., Measurement of the angle gamma, 20:2031 (R;FR)
Alekseenkov, O., [Guidelines for IAEA fellows and trainees], 20:2576 (RA;XA)
Alexander, M.A., *See* Bhatt, U.S., 20:1714
Alfthan, G., *See* Korkka-Niemi, K., 20:1842
Ali, M.N., *See* Goretta, K.C., 20:1168
Aliaga, J., *See* Gruver, J.L., 20:1985
Allard, P., *See* Cruz, D., 20:1481
Allen, M.G., Pulsed laser annealing of P implanted diamond, 20:1289 (R;AU)
Alling, P., *See* Hawryluk, R.J., 20:2443
Allison, M.L., Geological and petrophysical characterization of the Ferron Sandstone for 3-D simulation of a fluvial-deltaic reservoir: Quarterly report, April 1, 1994–June 30, 1994, 20:96 (R;US)
Allman, B.E., Observation of the scalar Aharonov-Bohm effect by neutron interferometry, 20:2004 (R;AU)
Allock, N.W., Uranyl complexes with heterocyclic carboxylic acids: The crystal and molecular structure of uranyl dinicotinate dihydrate, 20:1278 (IA;PL)
Allred, J.F., *See* Foley, R.D., 20:505, 20:1825
Altajskij, M.V., On fractal structure of quantum gravity and relic radiation anisotropy, 20:2057 (R;XJ)
Alvaradao, F.B., Training for the qualification and competence of nuclear power plant personnel in Mexico, 20:2479 (RA;XA)
Alvin, M.A., *See* Dennis, R.A., 20:18
See Newby, R.A., 20:9, 20:10
Amann, C., *See* Ott, J., 20:619
Amato, L.C., *See* DiCenso, A.T., 20:394, 20:395
Ambacher, O., Plasma-indued separation of amorphous siliced separation of amorphous silicon from silane: From the understanding of the hemichemical reation mection mechanism to separation of valuable amorphous silion with great rates of deposition, 20:1115 (I;DE;In German)
Ambrizzi, T., Rossby wave propagation and teleconnections for the Northern Hemisphere summer flow, 20:1713 (RA;US)
Ambrosi, P., *See* Alberts, W.G., 20:1942
Ambroz, H.B., Photochemical and radiation-chemical aspects of matrix acidity effects on organic sulphur compounds, 20:1401 (IA;PL)
Amiet, A., *See* Maddison, D.S., 20:1211
Amirkhanov, I.V., Dynamics of nonadiabatic charged particles in the magnetic dipole field with imposed homogeneous magnetic field, 20:2545 (R;XJ;In Russian)
Amonette, J.E., *See* Fruchter, J.S., 20:510
See Thornton, E.C., 20:517
Amos, L.O., *See* Richterich, L.R., 20:1496
Amrani, D., Studies of the physical parameters for the determination of tritium in urine by the liquid scintillation, 20:1635 (R;DZ)
Anami, S., *See* Kawamura, M., 20:1571
Anami, Shozo, *See* Hanaki, Hirofumi, 20:1575
See Honma, Hiroyuki, 20:1572
See Michizono, Shinichiro, 20:1567
See Yamaguchi, Seiya, 20:1576
Anantatmula, R.P., Feasibility study for the processing of Hanford Site cesium and strontium isotopic sources in the Hanford Waste Vitrification Plant, 20:323 (R;US)
Anast, K., Bench scale testing of micronized magnetite beneficiation: Quarterly technical progress report, January–March 1994, 20:4 (R;US)
Anchishkin, D., Nuclear matter equation of state with effects of excluded volume., 20:2218 (R;UA)
Anderl, R.A., *See* Dolan, T.J., 20:2436
Andersen, F.M., *See* Morthorst, P.E., 20:995
Andersen, S.I., Fatigue properties and design of wing blades for wind turbines: Final report for the period April 1, 1990 to March 31, 1993, 20:723 (R;DK)
Anderson, A.R., The behaviour of oxygen related defects in BSCCO near the critical temperature, 20:1205 (IA;AU)
See Godamanne, G., 20:1203
See Gu, G.D., 20:1218
See Sujito, 20:1183, 20:2372
Anderson, B., *See* Shaw, P., 20:262
Anderson, B.L., Predicting the pressure driven flow of gases through micro-capillaries and micro-orifices, 20:1442 (R;US)
Anderson, B.P., *See* Harlan, R.A., 20:559
Anderson, C.E. Jr., *See* Mullin, S.A., 20:1698
Anderson, C.M., *See* Pulsipher, B.A., 20:310
Anderson, G.L., *See* Oden, L.L., 20:264, 20:265
See Soelberg, N.R., 20:268
Anderson, J.C., Thermal modeling of packages for normal conditions of transport with isolation, 20:1429 (R;US)
Anderson, O.A., *See* Kwan, J.W., 20:1890
Anderson, R.N., Dynamic enhanced recovery techniques: Quarterly technical report, July 1994–September 1994, 20:116 (R;US)
Andersson, M., *See* Walker, S.R., 20:2330
Andersson, Peter, INTRAVAL Working group 2 summary report on Phase 2 analysis of the Finnsjoen test case, 20:1838 (R;SE)
Ando, Masami, Today and tomorrow of intravenous coronary angiography programme in Japan, 20:1878 (IA;JP)
Ando, Yoshikazu, Education and training program at Hamaoka Nuclear Power Station, 20:2478 (RA;XA)
Andraka, C.E., Recent reflux receiver developments under the US DOE program, 20:707 (R;US)
Andreasen, P., Utilization of straw- and wood pellets for fuelling of small heating systems, 20:628 (R;DK;In Danish)
Andreev, A.N., The investigation of the cross sections of Po isotopes formation in the ^{27} Al + ^{175} Lu and ^{31} P + ^{169} Tm reactions, 20:2265 (R;XJ;In Russian)
Andrews, G., Project report for the commercial disposal of mixed low-level waste debris, 20:260 (R;US)
Andrikidis, C., *See* Matthews, D.N., 20:1206
See Muller, K.H., 20:1200, 20:2382
Anerella, M.D., *See* Wanderer, P., 20:1544
Anlauf, H., WOPPER - a Monte Carlo event generator for W off-shell pair production including higher order electromagnetic radiative corrections, 20:2113 (RA;DE)
Anne, R., Exclusive and restricted inclusive reactions involving the ^{11}Be one-neutron halo, 20:2248 (R;FR)
See Piechaczek, A., 20:2227
Annenkov, A.N., *See* Korzhik, M.V., 20:1282
Annis, A., *See* Ashby, E.C., 20:330
Anthony, R.G., *See* Klavetter, E.A., 20:317
Antolak, A.J., Enhancements in the Livermore spectrum analysis package PIXEF, 20:2341 (R;US)
Anton, G., Hadronization in nuclear matter, 20:2243 (R;FR)
Antoniak, W., Computer operated 256 channel pulse analyser for scintillation and proportional detectors, 20:1640 (IA;PL)
Antonian, V. ter, *See* Nersessian, A., 20:1979
Anzelon, G., *See* Badalamente, R.V., 20:558
Apblett, C.A., *See* Parmeter, J.E., 20:1163
Appel, H., *See* Hartung, L., 20:1084
Appelbaum, J., Optimal design of large solar fields: Maximum energy output, 20:643 (IA;IL)
Aral, T., *See* Saegusa, T., 20:199
Arasteh, D., *See* Griffith, B., 20:1026
Araujo, C.F. de Jr., *See* Dey, J., 20:2088
Arbabi, S., *See* Fayers, F.J., 20:113
Arendt, P.N., *See* Pluym, T.C., 20:1238
Argyriou, D.N., Inelastic neutron scattering from cubic stabilised zirconia, 20:2334 (IA;AU)
Arigane, Kenji, Development of irradiation capsule for nuclear research reactor using aromatic polyether (BEK), 20:862 (R;JP;In Japanese)
Aringhoff, R., *See* Nava, P., 20:669
Armacost, L.L., Public values related to decisions in the Tank Waste Remediation System Program, 20:301 (R;US)
See Valero, O.J., 20:327
Arman, M.J., *See* Coleman, P.D., 20:1509
Armbruster, P., *See* Bernas, M., 20:2251
See Czajkowski, S., 20:2246
Armendariz, M.G., *See* Vawter, G.A., 20:1668
Armstrong, D.R., *See* Wood, D.E., 20:238
Arnold, C.C., Study of small carbon and semiconductor clusters using negative ion threshold photodetachment spectroscopy, 20:2296 (R;US)
Arnold, S.E., *See* Hitch, J.P., 20:225
Aro, I., Finnish programme and experience on training and qualification for nuclear power plant personnel, 20:2471 (RA;XA)
Aronson, M.C., *See* Cooley, J.C., 20:1232

Artru, X., Single spin asymmetry in inclusive pion production, Collins effect and the string model, 20:2198 (R;FR)
Arzarello, F., *See* Derrick, M., 20:2145
Asano, Ryoji, Experimental studies on long-term thermal degradation of enclosed neutron shielding resin, 20:1248 (IA;JP)
Ash, D.H., Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
See Salladay, D.G., 20:695
Ashby, E.C., Synthetic waste chemical mechanism studies, 20:330 (R;US)
Astrakhan, B.V., *See* Abazov, V.M., 20:1888
Atac, M., Aging tests of ethylene contaminated argon/ethane, 20:1625 (R;US)
Atkinson, B.A., *See* Sezgen, A.O., 20:991
Atkinson, C.A., *See* Shaw, M.E., 20:496
Atwood, C.L., Hits per trial: Basic analysis of binomial data, 20:802 (R;US)
Auciello, O.H., *See* Lin, Yuping, 20:1291
Audi, G., *See* Czajkowski, S., 20:2246
Auger, F., *See* Le Faou, J.H., 20:2212
See Suomijaervi, T., 20:2209
Aukrust, E., AISI Direct Steelmaking Program: Final technical report, 20:1111 (R;US)
Aumann, C.E., Oxidation behavior of aluminum nanopowders, 20:1157 (R;US)
Aumann, T., Neutron removal in peripheral relativistic heavy ion collisions, 20:2240 (R;DE)
Aune, B., *See* Fouaidy, M., 20:1554
Aunvong, S., Determination of ash content in lignite using X-ray backscattering technique, 20:1310 (IA;TH;In Thai)
Aurich, A., *See* Worbs, M., 20:70
Avens, L.R., *See* Schake, A.R., 20:503
Awadalla, N.G., Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility, 20:365 (R;US)
Axelsson, L., A new method to extract gas concentrations in the ultraviolet and visible wavelength ranges, based on differential optical absorption technique and Fourier transform, 20:1652 (R;SE)
Ayad, N.M.A., *See* Mohammed, F.A., 20:821
Ayad, R., *See* Derrick, M., 20:2145
Ayala Bravo, V., Involutive co-distributions preserved by transitive families of vector fields, 20:2041 (R;XA)
Azhgirej, L.S., Measurements of T_{20} in backward elastic d p scattering at deuteron momenta 3.5 - 6 GeV/c, 20:2260 (R;XJ)
New data on T_{20} in inclusive deuteron breakup at 9 GeV/c on protons and correlation between polarization observables, 20:2259 (R;XJ)
Aziz, K., *See* Fayers, F.J., 20:113
Azmy, Y.Y., *See* Penland, R.C., 20:2277
Azuelos, G., Single production of new leptons, 20:2134 (RA;DE)

B

Baba, Hitoshi, *See* Satoh, Kazuyuki, 20:1582
See Suzuki, Kunio, 20:1574
Baca, A.G., Complementary GaAs junction-gated heterostructure field effect transistor technology, 20:1505 (R;US)
Complementary GaAs junction-gated heterostructure field effect transistor fabrication for integrated circuits, 20:2307 (R;US)
See Shul, R.J., 20:1287
Bach, P.R., *See* Roberts, M.L., 20:1336
Bachovchin, D.M., *See* Newby, R.A., 20:9, 20:10
Badalamente, R.V., Determining information management needs for enhanced international safeguards, 20:558 (R;US)
Badamdamdin, R., *See* Korenman, G.Ya., 20:2290
Badawy, I., Development of IAEA safeguards at low enrichment uranium fuel fabrication plants, 20:161 (R;EG)
Safety in design and operation of low energy particle accelerators, 20:1513 (R;EG)
Badirkhan, Z., *See* Pastore, G., 20:1348
Badraoui, S., *See* Kirane, M., 20:2010, 20:2011
Baechler, M.A., *See* Thornton, E.C., 20:517
Baeckblom, G., First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones, 20:319 (R;SE)
Bagaeva, T.Yu., *See* Popov, V.V., 20:2343
Bailey, K.C., Director's series on proliferation, 20:1098 (R;US)
Baillargeon, M., Production of a Higgs with two gauge bosons, 20:2102 (RA;DE)
Baisden, P.A., Summer schools in nuclear chemistry: Final progress report, February 15, 1991–February 14, 1992, 20:1410 (R;US)
Bajo, S., Determination of ^{90}Sr in grass and soil, 20:1335 (R;CH)
Baker, J.B.H., Time-dependent atomic displacements in solid state diffusion, 20:2315 (IA;AU)
Baker, L., *See* Tingle, A.R., 20:1821
Baker, R.J., Zeeman Effect of the shallow acceptors Boron, Gallium and Thallium in Germanium at magnetic fields up to 7 T, 20:2285 (IA;AU)
Baker, S., Activation concentrations outside the SSC accelerator enclosures, 20:1598 (R;US)
Bakshi, E.N., *See* McKean, N.S., 20:1638
Balachandran, U., Ceramic membranes for methane conversion, 20:134 (R;US)
Balantekin, A.B., Universal features of multiplicity distributions, 20:2034 (R;US)
Baldit, A., *See* Bedjidian, M., 20:2385
Baldwin, D.L., *See* King, A.G., 20:1333
Baldwin, L.V., Engineering faculty forum: Final report, June 1, 1993–May 31, 1994, 20:926 (R;US)
Baleanu, D., The geodesic motion in Kaluza-Klein spinning space, 20:2035 (R;XA)
Baliga, R., 241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1, 20:370 (R;US)
See Julyk, L.J., 20:369, 20:371
Ball, C.J., Cell parameters and the orthorhombic to cubic transformation in strontium substituted perovskite ($CaTiO_3$), 20:1191 (IA;AU)
Balligand, H., Experimental investigation of the wake behind a solid disk, 20:1680 (R;US)
Balls, V., *See* Andrews, G., 20:260
Balslev-Olesen, O., Measurement and evaluation of combined solar heating system for space and water heating at Egebjerggaard 3 (Skotteparken), 20:699 (R;DK;In Danish)
Bamberger, J.A., 1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan, 20:297 (R;US)
Bane, K., *See* Tatchyn, R., 20:1526
Bangerter, R.O., Induction linacs for heavy ion fusion, 20:2445 (R;US)
Banister, J.R., Historical sketches of Sandia National Laboratories nuclear field testing: Volume 1: Full discussion except for sensitive references, 20:1695 (R;US)
Bao, G., *See* Engvik, L., 20:2223
Barashenkov, V.S., On a new type of long-range forces, 20:2056 (R;XJ)
Barb, M., *See* Ramer, R., 20:1209
Barbe, M., *See* Lewis, G.K., 20:1155
Barbee, T.W. Jr., *See* Farmer, J.C., 20:1004
Barber, D.S., *See* Miller, D.R., 20:514
Barber, R.L., *See* Woloshun, K., 20:1649
Barber, T.E., *See* Powell, G.L., 20:1338
Barbosa, V.A., *See* Machado Junior, M.A., 20:1875, 20:1876
Barczynska, J., Multilayer thin film colour selective filters, 20:1276 (IA;AU)
Bardin, D., Initial stet radiation corrections to off-shell W-pair production in e^+e^--annihilation, 20:2112 (RA;DE)
See Akhundov, A., 20:2158
Bardos, D.C., Two dimensional Bose plasma in a magnetic field, 20:2428 (R;AU)
Bardos, R.A., *See* Laird, J.S., 20:2327
Barefield, E.K., *See* Ashby, E.C., 20:330
Barger, V., Higgs bosons: Intermediate mass range at e^+e^- colliders, 20:2101 (RA;DE)
Barl, G., *See* Derrick, M., 20:2145
Barnes, C.M., Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)
Barnes, C.W., *See* Bell, M.G., 20:2444
See Zarnstorff, M.C., 20:2417
Barnes, P.A., *See* Howard, A.J., 20:1507

Barnes, P.R., The feasibility of replacing or upgrading utility distribution transformers during routine maintenance, 20:885 (R;US)
Barnett, S.A., Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)
Barnett, S.J., *See* Usher, B.F., 20:2324
Barnett, T.P., *See* Latif, M., 20:1752, 20:1754
Barney, D., *See* Martinez, V.A., 20:286
Baron, L.A., Waste management plan for the remedial investigation of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:507 (R;US)
Barreto, P.M.C., Uranium in the southern Sao Francisco Craton and marginal belts, 20:143 (I;BR)
Barriere, C., *See* Bedjidian, M., 20:2385
Bartak, J., The top-down reflooding model in the Cathare code, 20:761 (R;FR)
Bartel, A., *See* McKean, N.S., 20:1638
Barthels, H., *See* Rehm, W., 20:779
Bartholomay, R.C., Concentrations of tritium and strontium-90 in water from selected wells at the Idaho National Engineering Laboratory after purging one, two, and three borehole volumes, 20:1849 (R;US)
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)
Bartl, A., Vector bosons and Higgs bosons as signatures for charginos and neutralinos, 20:2136 (RA;DE)
Bartling, M.H., Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department, 20:294 (R;US)
Bartos, B., *See* Narbutt, J., 20:1318
Basa, S., THe proximity focused hybrid photodiode detector, 20:1647 (R;FR)
Basford, J.A., *See* Hayes, A.B., 20:1489
Basiev, T.T., *See* Reeves, R.J., 20:2332
Basile, M., *See* Derrick, M., 20:2145
Basra, T.S., 242-A Evaporator waste analysis plan: Revision 4, 20:401 (R;US)
Bass, B.R., *See* Keeney, J.A., 20:810
Bassett, R.L., Validation studies for assessing unsaturated flow and transport through fractured rock, 20:1824 (R;US)
Bastos, C.A., *See* Machado Junior, M.A., 20:1876
Batchelor, W.J., Neutron diffraction measurements of time-dependent transformation of plastically deformed Mg-PSZ, 20:2333 (IA;AU)
See Kelly, G.L., 20:1190
Bates, J.K., ANL Technical Support Program for DOE Environmental Restoration and Waste Management: Annual report, October 1992–September 1993, 20:216 (R;US)
Bates, S., *See* Franz, E.M., 20:240
Battisiti, D.S., *See* Bhatt, U.S., 20:1714
Bauch, J., On the research program forest decline at the site 'Postturm', forest district Farchau/Ratzeburg, 20:1807 (IA;DE;In German)
Bauer, D., *See* Tonn, B., 20:994
Bauer, G., *See* Atac, M., 20:1625
Bauhs, K.C., *See* Meyer, R.H., 20:1697
Baurichter, F., Levies as instruments of environment protection: aspects of water and energy economy, 20:917 (I;DE;In German)
Baveye, P., *See* Rittman, B.E., 20:1780
Bawin, M., Strong Coulomb coupling in relativistic quantum constraint dynamics, 20:2092 (R;FR)
Bayne, C.K., *See* Bartling, M.H., 20:294
Bazzani, A., A normal form approach to the theory of nonlinear betatronic motion, 20:1531 (R;XC)
Bazzoffi, P., *See* Mbagwu, J.S.C., 20:1797, 20:1798
Beam, T.G., B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
Beasley, G.A., *See* Chugh, Y.P., 20:79
Beaudet, R.A., Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)
Beaver, T.R., K-West and K-East basin thermal analyses for dry conditions, 20:346 (R;US)
Becher, P.F., *See* Lin, H.T., 20:1240
Beck, M.A., *See* Thornton, E.C., 20:517
Beck, M.J., *See* Hinton, M.M., 20:1777
Becker, C.D., Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)
Becker, R., Aspects of scalar lepton search, 20:2137 (RA;DE)
Beckman, G.W., Travel to Battelle Memorial Institute: Trip report, September 17, 24, and October 8, 1953, 20:152 (R;US)
Bedaque, P., Annihilation diagrams in two-body nonleptonic decays of charmed mesons, 20:2157 (R;XA)
Bede, M., One component, volume heated, boiling pool thermohydraulics, 20:790 (R;FR)
Bedja, I., *See* Kamat, P.V., 20:1373
Bedjidian, M., Study of the isospin symmetry breaking in the light quark sea of the nucleon from the Drell-Yan process, 20:2385 (R;FR)
Bednyakov, V.A., *See* Altajskij, M.V., 20:2057
Beenakker, W., Approximation for on-shell W-pair production at high and intermediate energies, 20:2111 (RA;DE)
Begg, B.D., *See* Ball, C.J., 20:1191
See Vance, E.R., 20:1213
Behr, V.L., *See* Akau, R.L., 20:1696
Behrens, R. Jr., Thermal decomposition reactions of HMX and RDX and their importance in predicting cookoff hazards, 20:1689 (R;US)
Beine, B., *See* Kugeler, K., 20:784
Beingessner, S.P., The second level trigger of the L3 experiment. Pt. 2: The event selection, 20:1584 (R,FR)
Bejan, A., Second law aspects of solar thermal energy conversion, 20:644 (IA;IL)
Belanger, G., Trilinear and quadrilinear W couplings in triple vector production, 20:2117 (RA;DE)
Belfort, G., *See* Koehler, J.A., 20:1343
Bell, J.M., *See* Barczynska, J., 20:1276
See Dligatch, S., 20:1275
See Skryabin, I.L., 20:2329
Bell, M.G., Fusion power production in TFTR, 20:2444 (R;US)
Bellagamba, L., *See* Derrick, M., 20:2145
Bellas, H.W., Weekly report, 100 Areas, June 2, 1955, 20:855 (R;US)
Weekly report, 100 Areas, May 26, 1955, 20:854 (R;US)
Bellazzini, R., *See* Donskov, S.V., 20:1585
Bellecci, C., Thermal storage for solar dynamic power generation: Performance indicators in a second law perspective, 20:645 (IA;IL)
Bellman, R., Performance measurement process, guidance document, 20:928 (R;US)
Bellomy, J.R., Project W-320 Heel Jet Secondary Catch Mechanism lateral load test, 20:1458 (R;US)
Belokurov, V.V., String-loop corrections to effective action and black-hole instabilities, 20:2049 (R;XA)
Beltran, L.O., The design and evaluation of three advanced daylighting systems: Light shelves, light pipes and skylights, 20:1021 (R;US)
Belyaev, S.N., (γ, n) cross section in heavy nuclei in the region of the giant quadrupole resonance, 20:2264 (R;XJ;In Russian)
Ben-Zvi, I., Milestone experiments for single pass UV/X-ray FELs, 20:1517 (R;US)
Benatti, F., *See* Ghirardi, G.C., 20:1978
Benbennick, M.E., Model tracking system for low-level radioactive waste disposal facilities: License application interrogatories and responses, 20:567 (R;US)
Bench, G.S., *See* Antolak, A.J., 20:2341
See Roberts, M.L., 20:1336
Benedetti, R.L., Site Support Program Plan for ICF Kaiser Hanford Company, 20:537 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2520 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2521 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2522 (R;US)

Benetis, N., *See* Salih, N.A., 20:1392
Bengtsson, L., Will greenhouse gas-induced warming over the next 50 years lead to higher frequency and greater intensity of hurricanes?, 20:1753 (R;DE)
See May, W., 20:1729
Benkhannouche, S., Systemic representation of a production system: the Sagace method, 20:222 (R;FR;In French)
Bennett, D.G., Alligator Rivers Analogue project. Geochemical Data Bases: Final Report - Volume 10, 20:1804 (I;AU)
Bennett, P.C., Advanced robotic technologies for transfer at Sandia National Laboratories, 20:1448 (R;US)
Benny, H.L., A quality control program for waste disposal vault closure, 20:334 (R;US)
Benrachi, F., Pre-scission light particle emission in the reaction ^{144}Sm (^{32} S, fission) at E_{lab} = 838 MeV: determining of a time scale, 20:2273 (R;FR;In French)
Benson, S.A., Trace element emissions, 20:63 (R;US)
Benz, N., Liquid chromatographic method for determination of water in soils and the optimization of anion separations by capillary zone electrophoresis, 20:1329 (R;US)
Beradino, A., *See* Weeks, J., 20:935
Berardinelli, S.P., *See* Stampfer, J.F., 20:1487
Beretz, D., Neutron spectrum effect on PV-steels embrittlement: dosimetry and qualification of irradiation locations in Osiris and Siloe reactors, 20:756 (R;FR)
Berezhiani, V.I., Self-focusing of electromagnetic radiation in electron-positron ion plasma, 20:2409 (R;XA)
See Carlini, G., 20:2411
Bergeson, C.L., Solid waste operations complex engineering verification program plan, 20:366 (R;US)
Bergey, M., *See* Flowers, L., 20:1001
Bergholt, L., *See* Guttormsen, M., 20:2274
Bergman, L., Personnel monitoring. 1993, 20:1945 (R;SE;In Swedish)
Bergman, W., *See* Reifenrath, W., 20:1700
Bergstroem, U., Leakage and accidental releases from Sillamaee waste depository and environmental risk assessment, 20:1859 (R;SE)
Berkoe, J.M., *See* Dilling, D.A., 20:777, 20:781
Berman, D., Outdoor I-V curves versus simulator measurements for characterizing photovoltaic modules, 20:647 (IA;IL)
The relative degradation of various kinds of photovoltaic module after 6-7 years exposure to desert conditions, 20:646 (IA;IL)
Berman, M., Prosperity Games prototyping with the American Electronics Association, March 8–9, 1994, 20:1050 (R;US)
Bernas, M., New fission fragments discovered in collisions of relativistic ^{238}U ions with Pb target nuclei, 20:2251 (R;FR)
See Czajkowski, S., 20:2246
Bernhard, W., *See* Krzyminiewski, R., 20:1385
Bernreuther, W., CP violation in top quark pair production, 20:2125 (RA;DE)
Berrier-Ronsin, G., *See* Anton, G., 20:2243
See Rotbard, G., 20:2244
See Vernotte, J., 20:2245, 20:2250
Berry, G.F., *See* Doctor, R.D., 20:59
Berry, J.T., Commercial fertilizers 1993, 20:1052 (R;US)
Summary data 1992, 20:1051 (R;US)
Berry, L.A., Plasma processing for integrated circuits, 20:1498 (R;US)
Bertin, P.Y., *See* Anton, G., 20:2243
Bertram, W.K., *See* Sabine, T.M., 20:2335
Bertsch, G.F., *See* Herrmann, M., 20:2235
Bertsch, Y., The second level trigger of the L3 experiment. Pt. 1: The implementation, 20:1583 (R;FR)
Bertulani, C.A., *See* Aumann, T., 20:2240
Besmann, T.M., Scale-up and modeling of forced chemical vapor infiltration, 20:725 (R;US)
Bess, C.E., *See* Jamison, M.E., 20:435
Bessho, Isao, *See* Morii, Yasutsugu, 20:1565
Bestion, D., *See* Bartak, J., 20:761
See Freitas, R., 20:748
Bett, A., GaAs thin film solar cells: Final report, 20:683 (R;DE;In German)
Betten, J., *See* Wolters, J., 20:1147
Bettmann, H., *See* Franz, K., 20:622
Bhasale, R., *See* Dou, S.X., 20:1120
Bhatia, S.L., CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground, 20:351 (R;US)
Bhatt, U.S., Interannual variability of north Atlantic Sea surface temperatures, 20:1714 (RA;US)
Bhattacharya, A., Dynamics of phase ordering of nematics in a pore, 20:2299 (R;XA)
Bialas, A., *See* Anton, G., 20:2243
Bickford, D.F., Selection of melter systems for the DOE/Industrial Center for Waste Vitrification Research, 20:431 (R;US)
Biede, O., Mathematical models and parameter study of a burning coal particle, 20:92 (R;DK)
Biermann, A.H., *See* Harrach, R.J., 20:515
Biermann, E., Field testing programme for solar- and wind energy applications in developing countries (REBRA): Final report, 20:999 (I;DE;In German)
Biggeri, U., *See* Kraner, H.W., 20:1616
Bij, J.J. van der, *See* Ghinculov, A., 20:2118
Bilenky, M., Tests of trilinear couplings of the vector bosons at future e^+e^--collider, 20:2115 (RA;DE)
See Bardin, D., 20:2112
Bilewicz, A., Separation of yttrium from strontium radionuclides on α-crystalline antimony peroxide, 20:1319 (IA;PL)
Billard, P., A few guidelines for improving the operating safety of nuclear power plants, 20:2472 (RA;XA)
Referential approach, 20:2473 (RA;XA)
Biner, S.B., The role of microcracking on the crack growth resistance of brittle solids and composites, 20:1280 (R;US)
Binks, R.A., *See* Sloggett, G.J., 20:2383
Binneberg, A., Low-temperature small refrigerating machinery and cryotechnical devices for the future use of high-temperature superconductors: Final report, 20:1499 (I;DE;In German)
Binon, F.G., *See* Donskov, S.V., 20:1585
Bird, G.W., Project 8980, Savannah River Plant, 200 Area: Water handling system, segregation of process water, 20:836 (R;US)
Birdwell, J.F., *See* Ramey, D.W., 20:293
Biryukov, S., Characterization of mirror reflectivity losses caused by dust deposited under various meteorological conditions, 20:648 (IA;IL)
Biscardi, R., Effects of RF side-bands on spectral reproducibility for infrared synchrotron radiation, 20:1528 (R;US)
Bischof, C.H., A divide-and-conquer method for tridiagonalizing symmetric matrices with repeated eigenvalues, 20:2528 (R;US)
A framework for symmetric band reduction and tridiagonalization, 20:2529 (R;US)
Bishay, S.T., A two dimensional code (R,Z) for nuclear reactor analysis and its application to the UAR-RI reactor, 20:840 (R;EG)
Bishop, A.R., *See* Wang Wen-zheng, 20:2297
Bishop, B.A., Ceramem filters for removal of particles from hot gas streams, 20:60 (R;US)
Biswal, B., Domain growth in weakly disordered magnets: A coupled map lattice approach, 20:2300 (R;XA)
Blach, T.P., Faraday magnetometer for studying interstitially modified ferromagnets, 20:2380 (IA;AU)
Black, S.C., US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1, 20:241 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)
Black, S.J., Conceptual design of an RTG Facility Transportation System, 20:1002 (R;US)
Blackford, M.G., *See* Vance, E.R., 20:1213
Blair, H.T, *See* Hoth, C.W,, 20:791
Blaising, J.J., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Blanc, H., *See* Krynicki, J., 20:1219
Blanco, J., *See* Malato, S., 20:666
Blau, M., Equivariant Kaehler geometry and localization in the G/G model, 20:2036 (R;XA)
Bleier, A., *See* Omatete, O.O., 20:1172
Blier, W., *See* Mitchell, T.P., 20:1730
Blink, J.A., *See* Lin, W., 20:322
Blix, H., Nuclear energy and the natural environment, 20:1884 (IA;PL)
Block, L.P., *See* Shapshak, M., 20:2425

Blok, H.P., *See* Anton, G., 20:2243
Blomberg, L.G., *See* Lindqvist, P.A., 20:2426
Bloomsburg, M.S., Weekly report November 18 to December 1, 1955: 300-M Area, Savannah River Plant, 20:845 (R;US)
Bloomstrand, R.R., Revised variable goal exposure plans for C-II-N and C-II-E material, 20:856 (R;US)
Bluemlein, J., Radiative corrections to leptoquark pair production in e^+e^- annihilation, 20:2135 (RA;DE)
Bluhm, D., *See* Greimann, L., 20:879
Blumenfeld, Y., *See* Le Faou, J.H., 20:2212
See Suomijaervi, T., 20:2209
Bobrowski, K., *See* Burlinska, G., 20:1394, 20:1399
Bock, R.E., *See* Etnier, E.L., 20:500
Bocquet, A.E., High energy photoelectron diffraction data from GaAs surfaces, 20:2321 (IA;AU)
Bodette, D.E., Reactor pumped laser research at the Sandia National Laboratories pulsed reactor facilities, 20:1506 (R;US)
Boeckenhauer, J., Localized endomorphisms of the chiral Ising model, 20:2032 (R;DE)
Boehm, J., *See* Alberts, W.G., 20:1942
Boer, E. de, *See* Michalik, J., 20:1382
Boer, G.J., Budgets and balances in a warmer world, 20:1710 (RA;US)
Bogard, R.S., *See* Thomas, J.M., 20:1947
Bogatyrev, I.V., *See* Chekushin, V.A., 20:1823
Bogdanov, D.D., *See* Andreev, A.N., 20:2265
Bogomolny, E., Statistical properties of the zeros of zeta functions - beyond the Riemann case, 20:1993 (R;FR)
Bohm, R., *See* Tonn, B., 20:1826
Bohn, R.G., *See* Compaan, A.D., 20:688
Boilley, D., Stochastic approach in the dynamics of nuclear collisions, 20:2228 (R;FR;In French)
Bolden, R.C., *See* Wootan, D.W., 20:397
Boldt, C., Directional solidification of the alumina-zirconia ceramic eutectic system, 20:1233 (R;US)
Boles, J.L., Wastes and by-products - alternatives for agricultural use, 20:1035 (R;US)
Boley, C.D., Computational model of drilling with high radiance pulsed lasers, 20:1451 (R;US)
Bollen, G., *See* Kluge, H.J., 20:1630
Bolmarcich, J.J., *See* Lynn, R.Y.S., 20:1678
Bolme, G.O., *See* Yuan, V.W., 20:1588
Bonche, P., *See* Gall, B., 20:2215
Bonnefon, H., *See* Bertsch, Y., 20:1583
Bonner, B., *See* Zucca, J.J., 20:713
Boonamsiri, V., *See* Pleehachinda, R., 20:1881
Boonyawan, D., Digital area monitor, 20:1632 (IA;TH;In Thai)
Boos, E.E., W, Z and H bosons in the three particle final states production at TeV energy γe and $\gamma\gamma$colliders, 20:2142 (RA;DE)
Booth, R.S., Guidance for the design and management of a maintenance plan to assure safety and improve the predictability of a DOE nuclear irradiation facility: Final report, 20:882 (R;US)
Booth, T.E., *See* Estes, G.P., 20:1650
Boothe, G.F., *See* Lamberd, D.L., 20:360
Boothroyd, A., [Technical Cooperation programmes organized by Division of Nuclear Power], 20:2489 (RA;XA)
Borchi, E., *See* Kraner, H.W., 20:1616
Borgstedt, H.U., Assessment of vanadium alloys for ITER application, 20:1113 (R;NL)
Borio, R., *See* Jennings, P., 20:88
Borkowski, M., Extraction of lanthanides, americium(III) and yttrium by TBP from thiocyanate and azide solutions, 20:1317 (IA;PL)
Borrel, V., *See* Piechaczek, A., 20:2227
Borzumati, F.M., Supersymmetric decays of the top quark, 20:2122 (RA;DE)
Borzunov, Yu.T., *See* Azhgirej, L.S., 20:2260
Boscherini, D., *See* Derrick, M., 20:2145
Bosiljevac, F., The UMTRA Project process and framework for execution, 20:481 (RA;US)
Boslough, M.B., *See* Cygan, R.T., 20:1285
Bosser, J., Workshop on beam cooling and related topics: Proceedings, 20:1547 (R;XC)
Botzet, M., *See* Bengtsson, L., 20:1753
Boudjema, F., Parameterizations of the W anomalous self-couplings, 20:2075 (RA;DE)
See Baillargeon, M., 20:2102
See Belanger, G., 20:2117
Bourcier, W.L., *See* Bates, J.K., 20:216
Bourdet, L., *See* Beretz, D., 20:756
Bourgoin, J.C., *See* Krynicki, J., 20:1219
Bourke, M.A.M., Strain measurement by diffraction at LANSCE, 20:1330 (R;US)
Boussoflane-Baudin, K., Non-linear sputtering effects induced by MeV energy gold clusters, 20:2359 (R;FR)
Boutemeur, M., *See* Donskov, S.V., 20:1585
Bovda, A.M., *See* Matsakova, A.A., 20:1224
Bowden, G.J., Electron paramagnetic resonance, magnetic susceptibility and resistance measurements on Mn doped 1:2:3 high temperatures superconductors, 20:2376 (IA;AU)
Elimination of multiple quantum artifacts in 2D COSY NMR spectra (EMA-COSY), 20:2284 (IA;AU)
See Cadogan, S.J.M., 20:1134
See Li, Hongshuo, 20:1133
Bowerman, B., *See* Franz, E.M., 20:240
Bowers, L.A., *See* Coleman, P.D., 20:1509
Boxberger, J., Compost preparation of agricultural and non-agricultural organic recyclings: Proceedings, 20:1057 (I;DE;In German)
Boyadjiev, A., *See* Mateeva, M., 20:281
Boyard, J.L., *See* Rousteau, S., 20:2161
Boyarkin, O., Neutrino mass and oscillation angle phenomena within the asymmetric left-right models, 20:2192 (R;XA)
Boyce, R., *See* Tatchyn, R., 20:1526
Boyd, R.E., The use of radioisotopes in human experiments: comments in response to recent media articles, 20:1417 (I;AU)
Boyer, K., *See* Rhodes, C.K., 20:2279
Boyle, J.R., *See* Tessmer, R.G. Jr., 20:1040
Braby, L.A., Pacific Northwest Laboratory annual report for 1993 to the DOE Office of Energy Research: Part 4: Physical sciences, 20:1941 (R;US)
Bracchi, M., *See* Machado Junior, M.A., 20:1877
Bradley, C.R., *See* Bates, J.K., 20:216
Brainard, J.R., *See* Francis, C.W., 20:223
Brambiett, G.C., *See* Dilling, D.A., 20:777
Brandel, B.P., *See* Goretta, K.C., 20:1168
Brandenburg, C., Forest pollution with airborne pollutants. Pollutant measurement. 5. report: Evaluation and presentation of airborne dust measurements in forest areas in Hessen, 20:1744 (I;DE;In German)
Brandt, J., *See* Hertel, G., 20:1818
Brannon, R.M., Experimental and numerical investigation of shock-induced full vaporization of zinc, 20:1681 (R;US)
Bransby, D.I., *See* McLaughlin, S.B., 20:630
Branscome, L.E., Climatic feedbacks between stationary and transient eddies, 20:1715 (RA;US)
See Gutowski, W.J. Jr., 20:1720
Bratvold, T., Radon discrimination for work place air samples, 20:471 (R;US)
Breckenridge, B., *See* Rope, R., 20:1793
Bredt, P.R., *See* Tingey, J.M., 20:309
Breed, C.E., Preventing atmospheric ammonia emissions: A generator/regulator solution, 20:1704 (R;US)
Breger, D., *See* Chipman, D.W., 20:1857
Brenner, D.S., *See* Casten, R.F., 20:2203
Bresard, I., Determination of the neutron and gamma dose rates and heatings induced by radioactive wastes in repository geological salt formations, 20:221 (R;FR)
Bretz, S.E., *See* Kurn, D.M., 20:992
Brevick, C.H., Supporting document for the historical tank content estimate for A Tank Farm, 20:385 (R;US)
Supporting document for the historical tank content estimate for B Tank Farm, 20:387 (R;US)
Supporting document for the historical tank content estimate for BY Tank Farm, 20:389 (R;US)
Supporting document for the historical tank content estimate for S tank farm, 20:391 (R;US)

Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm, 20:386 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm, 20:390 (R;US)
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm, 20:393 (R;US)
Brevick, J., *See* Mobley, C., 20:1112
Brewster, B.S., *See* Solomon, P.R., 20:729
Brezinsky, K., *See* Dryer, F.L., 20:130
Briancon, Ch., *See* Rotbard, G., 20:2244
Brice, D.K., *See* Kellerman, B.K., 20:1286
Bricker, T., Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)
Bridges, A.E., *See* Wootan, D.W., 20:397
Briere, M.A., Hydrogen incorporation and radiation induced dynamics in metal-oxide-silicon structures: A study using nuclear reaction analysis, 20:1660 (R;DE)
Briggs, J.B., *See* Shaw, M.E., 20:496
Briggs, R.S., Whole-building energy targets "A" prototype, initial version, 20:1031 (R;US)
Brinn, M.S., Incidents that require emergency operating procedures, 20:872 (R;US)
Briscoe, G.J., *See* Shaw, M.E., 20:496
Brizzi, R., *See* Fouaidy, M., 20:1554
Brochard, D., Fluid structure interaction in L.M.F.B.R. cores. Flowering response to an impulse load, 20:789 (R;FR)
Brock, B.C., Electromagnetic scattering from buried objects, 20:1685 (R;US)
Brockmeier, N.F., Cryogenic separation of CO_2 from the flue gas of conventional coal-fired power plants, 20:734 (R;US)
Bronner, W., *See* Bett, A., 20:683
Bronson, M.C., Advanced pyrochemical technologies for minimizing nuclear waste, 20:321 (R;US)
Brooks, R., *See* Jarboe, T., 20:2404
Brooks, S.L., Representing manufacturing features to support design and process changes, 20:1046 (R;US)
Brosche, D., Nuclear power in Germany, 20:968 (IA;PL)
Broton, M.S., *See* Benbennick, M.E., 20:567
Brouns, T.M., *See* Hagood, M.C., 20:1843
Brown, B.A., *See* Piechaczek, A., 20:2227
Brown, C.W., *See* Brooks, S.L., 20:1046
Brown, D.F., *See* Jamison, M.E., 20:435
Brown, J.J., *See* Yang, S., 20:1177
Brown, K., *See* Mao, N., 20:1540
Brown, M.J., *See* Williams, M.D., 20:1766
Brown, N.E., *See* Klavetter, E.A., 20:317
Brown, R.C., Radiological implications of contact maintenance: Impacts on facility design, 20:415 (R;US)
Brown, R.E., *See* Hwang, R.J,, 20:990
Brown, R.L., Radiological containment selection, design, and specification guide, 20:381 (R;US)
Brown, S.R., *See* Holcomb, D.J., 20:123
See Olsson, W.A., 20:467
Brown, W.S., Local control stations: Human engineering issues and insights, 20:831 (R;US)
See O'Hara, J.M., 20:830
Broyde, S., *See* Hingerty, B.E., 20:1948
Broz, R.E., Solid Waste Burial Grounds/Central Waste Complex hazards assessment, 20:345 (R;US)
Bruck, G.J., *See* Dennis, R.A., 20:18
Bruck, R.I., Forest decline in the Southern Appalachian Mountains. Research and observations: 1983-1989, 20:1817 (IA;DE)
Bruechle, W., *See* Schaedel, M., 20:1299, 20:2241
Brun, M.K., *See* Corman, G.S., 20:1063
Brunelle, A., *See* Boussofiane-Baudin, K., 20:2359
Bruni, A., *See* Derrick, M., 20:2145
Bruni, G., *See* Derrick, M., 20:2145
Bruni, P., *See* Derrick, M., 20:2145
Brunk, R.G., A novel geotechnical/geostatistical approach for exploration and production of natural gas from multiple geologic strata: Technical progress report, April–June, 1994, 20:131 (R;US)
Bruno, R., Training for the qualification and competence of nuclear power plant personnel in the United States, 20:2486 (RA;XA)
Brunson, M.L., Evaluation of hydrogen buildup in radioactive mixed waste drums, 20:367 (R;US)
Bruun Joergensen, O., Results from retrofitting with transparent insulation on three different residential houses in Denmark, 20:698 (RA;DK)
Bruzzi, M., *See* Kraner, H.W., 20:1616
Brzezinski, M.A., *See* Phillips, D.R., 20:1419
Buapeng, S., The use of environmental isotopes in ground water hydrology studies in Thailand, 20:1900 (IA;TH;In Thai)
Bubb, I.F., *See* Studd, W.B., 20:1313
See Walker, S.R., 20:2330
Buchert, M., Identification and analysis of data sources for data bases on greenhouse gas emissions in Germany not resulting from energy conversion processes: Study within IKARUS project, sub-project 9, 20:1760 (R;DE;In German)
Buck, J.W., *See* Pulsipher, B.A., 20:310
See Short, S.M., 20:511
Buckles, D.I., Acceptance test procedure for Project W-049H, 20:357 (R;US)
Buckley-Geer, E., Studies of prompt photon production and multijet production at the Tevatron Collider, 20:2153 (R;US)
Buczkowski, M., Some properties of foils and PTM made of different polymers irradiated by electrons, 20:598 (IA;PL)
See Ciesla, K., 20:1486
Buday, G., Selection of the type of spent fuel storage at Paks NPP, 20:198 (RA;XA)
Budny, R.V., *See* Bell, M.G., 20:2444
See Darrow, D.S., 20:2419
Budsky, F., *See* Prokop, J., 20:1413
Budyashov, Yu.G., *See* Abazov, V.M., 20:1888
Buelow, S.J., *See* Foy, B.R., 20:290
Buffleben, G.M., *See* Shepodd, T.J., 20:1688
Bulka, S., *See* Zimek, Z., 20:601
Bull, J., *See* Baker, S., 20:1598
Bullmann, M., *See* Iske, U., 20:1362
Bulusu, S., *See* Behrens, R. Jr., 20:1689
Buraczewska, I., Sensitivity to inhibitors of type II topoisomerase from mouse L5178Y lymphoma sublines: Resistant and sensitive to X radiation, 20:1922 (IA;PL)
Burastero, S., Quantitative evaluation of wrist posture and typing performance: A comparative study of 4 computer keyboards, 20:2563 (R;US)
See Tittiranonda, P., 20:2564
Burch, G.D., The U.S. Department of Energy's role in commercialization of solar thermal electric technology, 20:701 (R;US)
Burdanov, Ya.V., Excited states of mesons within the NJL model with the homogeneous vacuum gluon field, 20:2096 (R;XJ)
Mass splitting of the pseudoscalar and vector mesons induced by the homogeneous vacuum gluon field, 20:2095 (R;XJ)
Burdick, M.B., *See* Gates, T.A., 20:342
Burger, A., *See* George, M.A., 20:1621
Burgoa, B.B., *See* Moore, T.D., 20:227
See Watkins, D.R., 20:224
Burke, A.F., *See* Kramer, W.E., 20:1078
Burke, M.D., A double monochromator system for a medium resolution neutron powder diffractometer, 20:1636 (IA;AU)
Burkhart, R.D., Photophysical processes on triplet states and radical ions in pure and molecularly doped polymers, 20:1376 (R;US)
Burlinska, G., An ESR study of gamma irradiated polycrystalline methionine-containing peptides, 20:1399 (IA;PL)
ESR study of radiation induced radicals in solid peptides, 20:1394 (IA;PL)
See Pogocki, D., 20:1393, 20:1397
See Stachowicz, W., 20:1395, 20:1396, 20:1402
See Stuglik, Z., 20:1405, 20:1887
Burnett, R.A., A mathematical model of the temperature and current distributions in a deep stratified reservoir, 20:633 (R;US)
Burr, W., *See* Deimel, P., 20:1118

Bursill, L.A., Surface plasmon observed for carbon nanotubes, 20:2345 (R;AU)
See Qian, H., 20:2352
Burwinkle, T., *See* Hitch, J.P., 20:225
Buscheck, T.A., Evaluation of thermo-hydrological performance in support of the thermal loading systems study, 20:320 (R;US)
Busching, K.R., 616 Nonradioactive Dangerous Waste Storage Facility – Essential/support drawing list: Revision 2, 20:414 (R;US)
Bush, A.B.G., Diagnosis of balanced and unbalanced motions in a synoptic-scale baroclinic wave life cycle, 20:1716 (RA;US)
Butcher, K.S.A., *See* Lumpkin, N.E., 20:1137
Buttermore, W.H., Chloride and mercury monitors for air toxics measurements, 20:71 (R;US)
Button, J.C.E., Effects on the surrounding population of postulated major accidents at the AAEC Research Establishment, 20:832 (R;AU)
Byrd, K.R., *See* Meischen, S.J., 20:1870
Byrum, K., Charmonium production, b quark and B meson production and $b\bar{b}$ correlations at CDF, 20:2152 (R;US)

C

Cable, S.B., 1/f noise in two-dimensional fluids, 20:2406 (R;US)
Cabo Monte Oca, A. de, Analytic formulae for the Hartree-Fock order parameter at arbitrary p/q filling factors for the 2DEG in a magnetic field, 20:2362 (R;XA)
Cacheiro, R.A., *See* Sauers, I., 20:887
Cadogan, J.M., Magnetic properties of Er Co_{12} B_6:^{57} Fe, 20:1135 (IA;AU)
See Harker, S.J., 20:1138
See Li, Hongshuo, 20:1131
See Reza, K.A., 20:1132
See Xu, Jianmin, 20:1124
Cadogan, S.J.M., The magnetic properties of Gd $(Fe_{1-x}\ Co_x)_9\ Ti_2$ alloys, 20:1134 (IA;AU)
See Li, Hongshuo, 20:1133
Cai Jianping, Safety system of nuclear power plants and its management example, 20:957 (I;XA)
Cai, M., Low-frequency variation of a zonally localized jet stream: Observation and theory, 20:1717 (RA;US)
Cai, Z., Topography of neutron scattering from diblock copolymer film, 20:1239 (R;US)
Calka, A., *See* Onyszkiewicz, I., 20:1180
Calkins, W.H., *See* Klein, M.T., 20:39
Callot, O., EDFOR version 5.6: User guide and reference manual, 20:2550 (R;FR)
VAXNEWS version 3.12: User manual, 20:2548 (R;FR)
VAXNEWS version 3.12: Management manual, 20:2549 (R;FR)
Camelo-Cavalcanti, E.S., *See* Lemonnier, H., 20:1463
Cameron, C.P., *See* Ghanbari, C., 20:702
Cameron, R.J., *See* Peters, B.B., 20:518, 20:519
See Treat, R.L., 20:529
Campbell, J.A., Flammable gas safety program: Analytical methods development: FY 1994 progress report, 20:302 (R;US)
Waste Tank Organic Safety Program: Analytical methods development: Progress report, FY 1994, 20:303 (R;US)
Campbell, J.A.L., Scale-up of mild gasification to a process development unit: Quarterly report, February–May, 1994, 20:11 (R;US)
Campbell, L.J., *See* Bartholomay, R.C., 20:1785
Campbell, S.J., Mechanochemical transformation of hematite to magnetite: structural changes, 20:2318 (IA;AU)
See Harker, S.J., 20:1138
Campbell, W.M., Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)
Campo, F., Tecnatom training program. Presentation of Spain, 20:2509 (RA;XA)
Campos, F. de, *See* Eboli, O.J.P., 20:2105
Candy, J.V., Model-based inversion for a shallow ocean application, 20:1974 (R;US)
Model-based ocean acoustic passive localization: Revision 1, 20:1675 (R;US)
Canfield, P.C., *See* Cooley, J.C., 20:1232
Cannata, F., $\pi\pi$ and KK-bar channel coupling. Pt. 2: The $f_0(975)$ meson and KK-bar threshold effects, 20:2193 (R;FR)
Canney, S., *See* Storer, P., 20:1259
See Vos, M., 20:1255
Cannon, N.S., *See* Wootan, D.W., 20:397
Cao, L.Q., *See* Emerson, D.W., 20:145
Cap, J.S., Characterization of ignition overpressure using band limited temporal moments, 20:1683 (R;US)
Caplanis, S, *See* Gorenflo, D., 20:1473
Cappiello, M., *See* Lisowski, P.W., 20:1587
Caprari, R., *See* Storer, P., 20:1259
Cara Romeo, G., *See* Derrick, M., 20:2145
Carcreff, H., Gamma camera prototype for nuclear installation dismantling, 20:741 (R;FR;In French)
See Beretz, D., 20:756
Carden, J.L., *See* Carlton, W.H., 20:1778
Cardona, S., *See* Bett, A., 20:683
Carlini, G., Solitons in electron-positron plasma, 20:2411 (R;XA)
Carlqvist, P., Multicomponent double layers and selective acceleration of charged particles, 20:2424 (R;SE)
Carlson, R.W., *See* Anderson, B.L., 20:1442
Carlton, W.H., Mercury in shallow Savannah River Plant soil, 20:253 (R;US)
Mercury migration into ground water, a literature study, 20:1778 (R;US)
Carne, T., *See* James, G., 20:1445
Carnes, S.A., Negotiating equity for management of DOE wastes, 20:226 (R;US)
Carrara, P.E., *See* Shroba, R.R., 20:1840
Carrier, R.F., *See* Foley, R.D., 20:505, 20:1825
Carruthers, E., *See* Button, J.C.E., 20:832
Carson, R.D., Gasification Product Improvement Facility status, 20:14 (R;US)
Carter, C.D., *See* Paul, P.H., 20:1424
Carter, K.E., Fractal nature and scaling of normal faults, Rio Grande rift, NM: Implications for growth and strain, 20:1972 (R;US)
Carter, R.G., A worse-case example using linesearch methods for numerical optimization with inexact gradient evaluations, 20:2527 (R;US)
Carter, S., The development of an integrated multistage fluid-bed retorting process: Quarterly report, April–June, 1994, 20:140 (R;US)
Cartmell, D.B., Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
Carty, R.H., *See* Campbell, J.A.L., 20:11
Carudel, G., *See* Eid, M., 20:769
Carvallo, G., Presentation of decay heat removal computer codes used for gas cooled reactors, 20:780 (RA;XA)
Caryotakis, G., *See* Sprehn, D., 20:1594
Casalbuoni, R., The BESS model at e^+e^- colliders, 20:2132 (RA;DE)
Casey, E.F., A research study to determine the effect of Total Quality Management (TQM) on employee morale in Plant Procedures Division at EG&G, Rocky Flats, Inc., 20:911 (R;US)
Cash, R.J., *See* Epstein, M., 20:329
See Pulsipher, B.A., 20:310
See Rebagay, T.V., 20:420
Cashion, J.D., *See* Jinks, D., 20:2337
Casota, M.V. I., Training and qualification of NPP personnel in Romania, 20:2504 (RA;XA)
Caspersson, S.A., *See* Dilling, D.A., 20:777, 20:781
Caspi, S., *See* Sullivan, M., 20:1609
Castellini,, *See* Derrick, M., 20:2145
Casten, R.F., Evidence for pervasive phonon structure of nuclear excitations, 20:2204 (R;US)
Robust predictions of the interacting boson model, 20:2205 (R;US)
Universal correlations of collective observables: Empirical phenomenology and model interpretations, 20:2203 (R;US)
Castillo, T., Plastic encapsulated parts, 20:1501 (R;US)
Castleman, A.W. Jr., Cluster reactions: An approach to understanding the fundamentals of heterogeneous catalysis, 20:1345 (R;US)
Castor, J., *See* Bedjidian, M., 20:2385
Catchpole, G., Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)

Cathro, I.S., Progress with Scottish Nuclear's proposals for the construction of dry fuel stores at Torness and Hunterston 'B' power stations, 20:205 (RA;XA)
Cato, D.M., Drum investigation committee final report, 20:212 (R;US)
Cecil, L.D., Concentrations of dissolved radon-222 in water from selected wells and springs in Idaho, 1989-91, 20:1784 (R;US)
See Ott, D.S., 20:1783
Cerdeira, H.A., *See* Gruver, J.L., 20:1985
Cerf, N., Finite population-size effects in projection Monte Carlo methods, 20:1997 (R;FR)
Realistic microscopic level densities for spherical nuclei, 20:2216 (R;FR)
Cernosek, R.W., High frequency current sensors using the Faraday effect in optical fibers, 20:1669 (R;US)
Cerutti, J.H., *See* Rider, W.J., 20:1476
Chaiko, D.J., *See* Francis, C.W., 20:223
Chakrabarti, A., *See* Bhattacharya, A., 20:2299
Challa, R., *See* Greimann, L., 20:879
Chambell, S.J., The influence of cationic and anionic surfactants on ball milled barium ferrite, 20:1178 (IA;AU)
Chambers, A.G., *See* Soelberg, N.R., 20:268
Chambers, R.S., The numerical integration and 3-D finite element formulation of a viscoelastic model of glass, 20:1288 (R;US)
Chambon, T., *See* Bedjidian, M., 20:2385
Chan, C.T., π-η mixing from QCD sum rules, 20:2081 (R;US)
Chan, K.T., *See* Su, Z.P., 20:2306
Chandler, G.T., *See* Kanne, W.R. Jr., 20:813
Chandralal, H.N.K.K., *See* Devendra, R., 20:586
Chandy, K.M., *See* Foster, I.T., 20:2530
Chang, H.T., Development of novel separation techniques for biological samples in capillary electrophoresis, 20:1865 (R;US)
Chang, R.P.H., *See* Lin, Yuping, 20:1291
Chankow, N., Low-cost nuclear technique for lignite ash determination, 20:1305 (IA;TH;In Thai)
See Aunvong, S., 20:1310
See Chantree, K., 20:1309
Chankowski, P.H., *See* Rosiek, J., 20:2106
Chantree, K., Determination of ash content in lignite using gamma-ray transmission technique, 20:1309 (IA;TH;In Thai)
Chaplin, D.H., *See* Hutchinson, W.D., 20:2319
Chapline, G.C. Jr., *See* Farmer, J.C., 20:1004
Charach, Ch., *On the second law efficiency of thermal energy storage, 20:649 (IA;IL)
Charlesby, A., Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules, 20:1390 (IA;PL)
Chase, J.A., Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
Chasensky, T.M., *See* Reifman, J., 20:820
Chason, E., *See* Kellerman, B.K., 20:1286
Chasov, V.V., EPR of a nitroxide adsorbed on SiO_2 and La_2O_3, 20:1355 (IA;PL)
Chastain, S.A., Waste management plan for Hanford spent nuclear fuel characterization activities, 20:348 (R;US)
See Wootan, D.W., 20:397
Chataing, T., *See* Clement, P., 20:757
Chaurand, P., *See* Boussofiane-Baudin, K., 20:2359
Chavez, J.M., The solar two project: A status and discussion of performance assessment, 20:650 (IA;IL)
Chekushin, V.A., Report on joint ecogeochemical mapping and monitoring in the West Murmansk Region and the contiguous areas of Finland and Norway, 20:1823 (R;NO)
Chel, S., *See* Fouaidy, M., 20:1554
Chen, A.L., Photoluminescence under pressure and annealing of nitrogen-doped ZnSe, 20:1283 (R;US)
Chen, C.K., Quality assurance technical cooperation and training, 20:2492 (RA;XA)
Chen, K.T., *See* George, M.A., 20:1621
Chen, Nan, *See* Goretta, K.C., 20:1168
Chen, T.F., Impact characteristics of energy absorbing materials for radioactive material transport packages, 20:1250 (IA;JP)
Chen, W.W., Seismic qualification of ventilation stack, 20:1453 (R;US)
Chen, W.Y., Low-frequency anomalies in the NMC MRF model and reality, 20:1718 (RA;US)
Chen, Wei-Yin, Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994, 20:69 (R;US)
Chen, X., *See* Wright, J., 20:509
Chen, Y., Dielectric relaxations in yttria-stabilised zirconia alloys at lower temperatures, 20:1198 (IA;AU)
Glassy thermal expansion of cubic stabilised zirconia alloys, 20:1199 (IA;AU)
Chendo, M.A.C., *See* Maduekwe, A.A.L., 20:641, 20:1747
Cheney, J.A., Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)
Cheng, E., Wetting transitions of classical liquid films: A nearly universal trend, 20:2023 (R;FR)
Cheng, J.J., *See* Faillace, E.R., 20:1906
See Yu, C., 20:218
Cheng, X.K., *See* Osotchan, T., 20:2393
Chepigin, V.I., *See* Andreev, A.N., 20:2265
Chepliko, N., *See* Kostyuk, A., 20:2054
Cherniavski, A.A., *See* Koltun, M.M., 20:663
Chernoff, A., The Uranium Mill Tailings Remedial Action Project, 20:479 (RA;US)
Chernoff, A.R., *See* Nelson, R.A., 20:975
Chernykh, E.V., *See* Azhgirej, L.S., 20:2259, 20:2260
Cheung, K., *See* Barger, V., 20:2101
Chhabildas, L., *See* Trucano, T., 20:1444
Chhabildas, L.C., *See* Brannon, R.M., 20:1681
Chiang, Ray-Kuang, *See* Kenney, M.E., 20:51
Chiao, T., CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
Chiappetta, P., *See* Casalbuoni, R., 20:2132
Chiba, Satoshi, QMD calculation of nucleon-nucleus reaction cross sections, 20:2257 (RA;JP)
Chigier, N., *See* Mansour, A., 20:1493
Chin, J., *See* Hoyer, E., 20:1590
Chin, V.W.L., *See* Osotchan, T., 20:2393
Chipman, D.W., Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)
Chirkina, L.A., *See* Okovit, V.S., 20:1142, 20:1229
Chiron, M., *See* Lee, Y.K., 20:814
Chmielewski, A., *See* Harasimowicz, M., 20:594
Chmielewski, A.G., Radiation technologies and nuclear techniques friendly to man and environment, 20:590 (IA;PL)
Separation factors of H/D and $^{16}O/^{18}O$ in permeation of natural water through PTFE membranes, 20:1320 (IA;PL)
The dynamics of extraction column, 20:595 (IA;PL)
The pilot plant for electron beam flue gas treatment. Two-stages irradiation test, 20:599 (IA;PL)
See Dziewonski, Z., 20:604
See Palyska, W., 20:600
See Zimek, Z., 20:601
Chmielewski, P.J., EPR investigations of iminoxy free radicals and paramagnetic metal-oxime systems, 20:1352 (IA;PL)
Cho, E., *See* Martino, L., 20:1773
Cho, Sunghwan, *See* Yu, Liya, 20:55
Chollet-Le Flour, F., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Chomaz, Ph., *See* Suomijaervi, T., 20:2209
Chongchirasiri, C., *See* Pleehachinda, R., 20:1881
Chongchirasiri, S., *See* Tojinda, N., 20:1882
Chongkum, S., Present status of radiation utilization in Thailand, 20:2512 (IA;JP)
See Dharmavanij, W., 20:610, 20:611
Chou, W., Feasibility study of aluminum beam tube for the collider: An option for no-coating and no-liner, 20:1596 (R;US)
Chowdhury, D., *See* Biswal, B., 20:2300
Choy, T.C., *See* McKinnon, B.A., 20:2304
Christensen, W., *See* Woloshun, K., 20:1649
Christian, D.C., Triggers for a high sensitivity charm experiment, 20:1548 (R;US)
Christian, J.E., [Low-slope re-roofing workshop keynote], 20:1431 (R;US)

Christon, M.A., A mixed time integration method for large scale acoustic fluid-structure interaction, 20:1452 (R;US)
Christy, J.T., 200 Area monthly report, July 1966, 20:158 (R;US)
Chriswell, C.D., *See* Buttermore, W.H., 20:71
Chu, T.C., *See* Yen, S.C.M., 20:56
Chugh, Y.P., Management of high sulfur coal combustion residues, issues and practices: Proceedings, 20:79 (R;US)
Chukwu, W.I.E., *See* Mbagwu, J.S.C., 20:1798
Chung, D.D.L., *See* Shi, Zheng-Qiang, 20:1241
Chung, H.M., Properties of V-4Cr-4Ti for application as fusion reactor structural components, 20:1100 (R;US)
Chung, Joon Keuk, Benefits of nuclear power in a developing country. Nuclear power development policy in Korea, 20:956 (I;XA)
Church, E.L., Image quality, surface statistics and all that, 20:2308 (R;US)
Specification of the figure and finish of EUV mirrors in terms of performance requirements, 20:1428 (R;US)
Specification of the surface figure and finish of optical elements in terms of system performance, 20:1541 (R;US)
Chusanathas, S., *See* Buapeng, S., 20:1900
Chwastowska, J., A study of analytical properties of chelating sorbents obtained by immobilization of chelating agents on solid supports. Analytical properties of thionalide loaded acrylic resin, 20:1325 (IA;PL)
Ciesla, K., Particle track membranes (PTM) examinations by small-angle X-ray scattering, 20:1486 (IA;PL)
The wide-range X-ray scattering of structural changes in PETP occurring under heavy ions irradiation, 20:2357 (IA;PL)
Cieslak, M.J., *See* Jellison, J.L., 20:1164
Cieslak, W.R., *See* Levy, S.C., 20:899
Cimmino, A., *See* Allman, B.E., 20:2004
Cist, J.D., Project 8980, Savannah River Plant, 105-C power calculator, 20:825 (R;US)
Ciurapinski, A., Application of track autoradiography to determination of nitrogen distribution in surface layers of steels subjected to LPCVD and PVD processes and thermo-chemical treatment, 20:1485 (IA;PL)
Studies on the structure and properties of steel and ceramics surfaces modified by high intensity pulsed ion beams, 20:1484 (IA;PL)
Clark, C., Zinc/air technology, December 1993 meeting report, 20:900 (R;US)
Clark, D., Preliminary site characterization - final report, 20:442 (R;US)
Clark, G.F., *See* Usher, B.F., 20:2324
Clark, J.W., *See* Gernoth, K.A., 20:2388, 20:2389
Clark, L.L., *See* Short, S.M., 20:511
Clauss, S., *See* Campbell, J.A., 20:302
Clauss, S.A., *See* Campbell, J.A., 20:303
Clem, J.R., *See* Khaykovich, B., 20:2384
Clemens, H., *See* Borgstedt, H.U., 20:1113
Clemens, J.C., *See* Basa, S., 20:1647
Clement, P., PWR accident management realated tests: some Bethsy results, 20:757 (R;FR)
Clemmons, J.S., *See* Jamison, M.E., 20:435
Clemons, J.S., Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification, 20:436 (R;US)
Clergeau, J.F., A micro-strip gas counter test with the RD20 front-end, 20:1653 (R;FR)
Cletcher, J.W., *See* Vanden Heuvel, L.N., 20:875, 20:876
Cleveland, J., *See* Rehm, W., 20:779
Cline, R.E. Jr., *See* Strayer, W.T., 20:2559
Clow, J., Specific activities and DOE-STD-1027-92 hazard Category 2 thresholds, LANL fact sheet, 20:502 (R;US)
cmpbell, S.J., *See* Cadogan, J.M., 20:1135
Coates, J.H., Uranium Enrichment, an overview, 20:147 (R;FR)
Cobo, J.M., Inhibition of mitotic-specific histone phophorylation by sodium arsenite, 20:1967 (R;US)
Cochrane, J.W., Electromagnetic response of high-Tc thick films, 20:2374 (IA;AU)
See Gu, G.D., 20:1218
Cockayne, D.J.H., *See* Hall, L.E., 20:1263
Cockrell, A.B., Core sample truck improvement test report, 20:422 (R;US)
Cockroft, N.J., *See* Quagliano, J.R., 20:1503
See Shimada, Tsutomu, 20:1765
Coffey, H.T., *See* Rote, D.M., 20:1081
Cohen, D.D., *See* Martin, J.W., 20:1217, 20:1637
See Walker, S.R., 20:2330
Cohen, G., Comparison of SEGS solar field performance from laboratory and operating plant testing, 20:651 (IA;IL)
See Kenan, G., 20:659
Cohn, S.M., *See* Barnes, P.R., 20:885
Colby, J.M., *See* Gretsinger, W.T., 20:405
Cole, M.W., *See* Cheng, E., 20:2023
Coleman, P.D., Development status of an intense beam klystron, 20:1509 (R;US)
Collings, E.W., Long-length high-Tc superconductor processing, properties and applications, 20:1208 (IA;AU)
See Liu, H.K., 20:1192
Collins, R.E., *See* Yin, Y., 20:1261
Collins, S.R., Silicon-Film™ photovoltaic manufacturing technology: Semiannual subcontract report, 15 October 1993–15 April 1994, 20:684 (R;US)
Coltharp, K.A., *See* Ramey, D.W., 20:293
Comelli, D., Bound on the lightest Higgs mass in the minimal ηmodel at one loop, 20:2188 (RA;DE)
Commercon, M., *See* Basa, S., 20:1647
Compaan, A.D., Thin-film cadmium telluride photovoltaic cells: Final subcontract report, 1 November 1992–1 January 1994, 20:688 (R;US)
Comsan, M.N.H., *See* Fouad, M.F., 20:2224
Comtet, A., Trace formula for Riemann surfaces with magnetic field, 20:1992 (R;FR)
Con Foo, Jenice, Photoemission study of the Fermi surface of Cu, 20:2392 (IA;AU)
Conca, J.L., *See* Wright, J., 20:509
Conde, M.E., *See* van der Geer, B., 20:1524
Confort, E., *See* Cruz, D., 20:1481
Coniglione, R., *See* Le Faou, J.H., 20:2212
Conn, C., *See* Ediriweera, R.N., 20:1267, 20:1274
See Pillai, S.M., 20:1254
Conner, J.M., *See* Kupfer, M.J., 20:528
Connolly, M.J., *See* Liekhus, K.J., 20:256
Conoley, C., *See* Isobe, H., 20:1803
Conrads, T.J., Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances, 20:332 (R;US)
Consort, S.D., Research of documents pertaining to waste migration from leaking single-shell tanks, 20:472 (R;US)
Constantinescu, O., *See* Rotbard, G., 20:2244
Contardo, D., *See* Bedjidian, M., 20:2385
See Clergeau, J.F., 20:1653
Contenson, G. de, *See* Joly, C., 20:823
Conti, M., *See* Bellecci, C., 20:645
Cook, J.E., *See* Button, J.C.E., 20:832
Cook, J.R., *See* Carlton, W.H., 20:253
See Seitz, R.R., 20:239
See Wood, D.E., 20:238
Cook, S., Decontamination & Decommissioning Equipment Tracking System (DDETS), 20:1915 (R;US)
Cooley, J.C., Magnetic field dependence of the correlation gap in SmB_6, 20:1232 (R;US)
Cooper, E., *See* Panyatipsakul, Y., 20:1312
Cooper, W.E., Mechanical design of the D0 silicon detector, 20:1626 (R;US)
Copinger, D.A., *See* Vanden Heuvel, L.N., 20:875, 20:876
Coquereaux, R., Currents on Grassmann algebras, 20:2060 (R;FR)
Corbett, J., Algorithms for orbit control on SPEAR, 20:1608 (R;US)
Cordani, L.K., *See* Barreto, P.M.C., 20:143
Cordani, U.G., *See* Fuck, R.A., 20:1301
Corless, R.F., *See* Shul, R.J., 20:1287
Corlett, J., *See* Pendleton, R., 20:1613
Corman, G.S., Toughened Silcomp composites for gas turbine engine applications: Continuous fiber ceramic composites program: Phase I final report, April 1992–June 1994, 20:1063 (R;US)
Cornet, F., Testing the anomalous ZZ$\gamma$and Z$\gamma\gamma$vertices in e$\gamma\rightarrow$eZ, 20:2119 (RA;DE)

Corre, J., *See* Joly, C., 20:823
Corredoura, P., RF Feedback Analysis for 4 cavities per klystron in PEP-II, 20:1611 (R;US)
Corrigan, J.P., Experiences in selling irradiated produce at the retail level, 20:1896 (IA;JP)
Corwin, W.R., Heavy-Section Steel Irradiation Program: Volume 2, No. 2: Semiannual progress report, April–September 1991, 20:1160 (R;US)
Costa, C.C., *See* Barreto, P.M.C., 20:143
Costa, G., *See* Machado Junior, M.A., 20:1875
Costigan, K.R., Large eddy simultations of the atmospheric boundary layer east of the Colorado Rockies, 20:1764 (R;US)
Cottingham, W.N., Bubble nucleation rates in first-order phase transitions, 20:2020 (R;FR)
Cotton, W.R., *See* Costigan, K.R., 20:1764
Cottrell, W.D., *See* Foley, R.D., 20:504
Cotzas, G.M., *See* McDonald, C.F., 20:770
Couchell, G.P., *See* Schier, W.A., 20:2276
Coulter, R.L., Stability effects on the profiles of vertical velocity and its variance in katabatic flow, 20:717 (R;US)
Courtellle, C., Visible photoluminescence from hydrogenated silicon particles suspended in a silane plasma, 20:2418 (R;CH)
Coutant, C.C., Exploratory studies of the interactions of gas supersaturation and temperature on mortality of juvenile salmonids, 20:637 (R;US)
See Becker, C.D., 20:447
Coutelle, R., Field test of a wind-powered vapour compression plant for sea-water desalination in stand-alone operation: Final report, 20:719 (I;DE;In German)
Couture, S., Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)
Cowan, G.D., Studies of QCD in e^+e^- collisions at 500 GeV, 20:2129 (RA;DE)
Coyne, R., *See* Watson, R.W., 20:2560
Craft, D.J., *See* Boles, J.L., 20:1035
Cramer, E.R., *See* Beaver, T.R., 20:346
Cramer, G., Coordination and optimisation of collaboration between wind park, solar park and the weak electrical supply grid on the island of Kythnos: Final report. Period covered: July 1, 1985 to December 31, 1991, 20:1059 (I;DE;In German)
Crancher, D.W., *See* Button, J.C.E., 20:832
Crane, J.K., Observation of strong emission from NeIX and NeX transitions in a laser-driven plasma, 20:1510 (R;US)
Crawfis, R., *See* Max, N., 20:2561
Crawford, O.H., *See* Hingerty, B.E., 20:1948
Crawley, J.E. Jr., Report of trip to Los Alamos, Albuquerque Operations Office, and ACF Industries, September 17–19, 1956, 20:1434 (R;US)
Creagh, S.C., *See* Pavloff, N., 20:2363
Crecy, F. de, A better approach to the MDNBR concept, 20:1464 (R;FR)
The effect of grid assembly mixing vanes on critical heat flux values and azimuthal location in fuel assemblies, 20:760 (R;FR)
Creighton, J., *See* Armacost, L.L., 20:301
Cremers, D., *See* Lewis, G.K., 20:1155
Crider, S.A., Re-engineering facilities management at Los Alamos: Managing the behavioral change, 20:2516 (R;US)
Crippen, M.D., *See* Epstein, M., 20:329
Crisp, R.S., Porous silicon studies by soft X-ray emission spectroscopy, 20:2323 (IA;AU)
Cristea, V., *See* Strugaru, D., 20:1357
Crockett, A.B., *See* White, G.J., 20:1792
Cromar, R.D., Statistical characterization report for Single-Shell Tank 241-T-107, 20:417 (R;US)
Cronan, C.S., ALBIOS: an analysis of aluminium biogeochemistry in forested watersheds of North America and Northern Europe, 20:1951 (IA;DE)
Cronauer, D.C., Catalysts and process developments for two-stage liquefaction: First quarterly technical progress report No. 52, October 1, 1991–December 31, 1991, 20:19 (R;US)
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Catalysts and process developments for two-stage liquefaction: Report No. 12, quarterly technical progress report, April 1, 1989–June 30, 1989, third quarter FY 1989, 20:21 (R;US)
Catalysts and process developments for two-stage liquefaction. Report No. 8: Quarterly technical progress report, second quarter FY 1989, January 1, 1989–March 31, 1989, 20:22 (R;US)
Catalysts and process developments for two-stage liquefaction. Report no. 16: Quarterly technical progress report, fourth quarter FY 1989, July 1, 1989–September 30, 1989, 20:23 (R;US)
Catalysts and process developments for two-stage liquefaction: Report No. 20, quarterly technical progress report, October 1, 1989–December 31, 1989, first quarter FY 1990, 20:24 (R;US)
Catalysts and process developments for two-stage liquefaction, Report No. 24: Quarterly technical progress report - Second quarter FY 1990, January 1, 1990–March 31, 1990, 20:25 (R;US)
Croson, M.L., *See* Lundberg, L.B., 20:816
Cruse, J.M., *See* Treat, R.L., 20:529
Crutchik, M., *See* Appelbaum, J., 20:643
Cruz, D., Modular bench for non destructive controls, 20:1481 (R;FR;In French)
Cubasch, U., *See* Hegerl, G.C., 20:1755
Cugnon, J., *See* Bawin, M., 20:2092
Cullis, A.G., *See* Usher, B.F., 20:2324
Cunningham, G.R., *See* Bartling, M.H., 20:294
Cure, J.D., *See* Strain, B.R., 20:1968
Curl, R.U., *See* Wood, D.E., 20:238
Curtis, D.B., Radionuclide release rates from spent fuel for performance assessment modeling, 20:1856 (R;US)
See Fabryka-Martin, J.T., 20:1805
Cushing, C.E., Hanford Site National Environmental Policy Act (NEPA) characterization: Revision 6, 20:579 (R;US)
See Rose, F.L., 20:1908
Cuypers, F., Discovering supersymmetry with electron and photon beams, 20:2138 (RA;DE)
See Aeppli, A., 20:2110
See Baillargeon, M., 20:2102
Cygan, R.T., Analysis of experimentally shocked minerals by NMR spectroscopy, 20:1285 (R;US)
Czajkowski, S., Separation and implantation of relativistic ^{86}Kr-fragments at the FRS: Half-life measurement by ion-β time-correlations, 20:2246 (R;FR)
See Bernas, M., 20:2251
Czyzewski, J., *See* Artru, X., 20:2198

D

D'Andrea, F., *See* Tosi, E., 20:1738
d'Entremont, P.D., *See* Jamison, M.E., 20:435
D'Incerti, L., *See* Machado Junior, M.A., 20:1877
Dabelstein, A., Radiative corrections in the MSSM Higgs sector: masses and fermionic decays, 20:2186 (RA;DE)
Dagan, E., *See* Kribus, A., 20:664
Dahl, R., *See* Rousteau, S., 20:2161
Dahmen, H.D., *See* Anlauf, H., 20:2113
Daicic, J., Magnetized pair Bose gas: relativistic superconductor, 20:2398 (R;AU)
Statistical mechanics of magnetized pair Fermi gas, 20:2070 (R;AU)
Statistical mechanics of relativistic spin-1 bosons in a magnetic field, 20:2072 (R;AU)
Statistical mechanics of the magnetized pair Bose gas, 20:2069 (R;AU)
Damkroger, B.K., *See* Dunn, P.S., 20:1156
Damle, A.S., Facilitated transport ceramic membranes for high temperature H_2S removal, 20:17 (R;US)
Dancewicz, A.M., *See* Sochanowicz, B., 20:1923
Daniel, A.R., *See* Shepodd, T.J., 20:1688
Daniels, E.J., *See* Brockmeier, N.F., 20:734
Danko, B., Elaboration of the universal method of radiochemical separation of molybdenum from irradiated biological samples for NAA purposes, 20:1323 (IA;PL)
Darrow, D.S., ICRF-induced DD fusion product losses in TFTR, 20:2419 (R;US)
Dart, D.L., *See* Sloggett, G.J., 20:2383

Darvill, A., Structural studies of complex carbohydrates of plant cell walls: Progress report, December 15, 1990–December 14, 1991, 20:1893 (R;US)
Das, A., *See* Bedaque, P., 20:2157
Das, M.P., How do the oxides and fullerides superconduct?, 20:1268 (IA;AU)
See Jackson, D.J.C., 20:2370
See Xu, W., 20:2322
Das, S.R., Boundary dynamics in dilaton gravity, 20:2043 (R;XA)
Dasnieres de Veigy, A., Equation of state of an anyon gas in a strong magnetic field, 20:2021 (R;FR)
Dastidar, P., Nuclear power. Status and development trends, 20:963 (IA;PL)
Datta, D.P., Geometric gauge fields in semiclassical gravity, 20:2042 (R;XA)
Relevance of induced gauge interactions in decoherence, 20:2045 (R;XA)
Dauble, D.D., *See* Geist, D.R., 20:1969
See Gray, R.H., 20:835
Daugherty, D., *See* Hitch, J.P., 20:225
Dave, R.N., *See* Rosato, A.D., 20:1671
Davenport, R., *See* Grossman, J.W., 20:706
David, S.A., *See* Vitek, J.M., 20:1106
Davidenko, V.D., *See* Mosevitskij, I.S., 20:782
Davidson, G.R., *See* Bassett, R.L., 20:1824
Davidson, J.R., ELIPGRID-PC: A PC program for calculating hot spot probabilities, 20:1827 (R;US)
Davis, D., *See* Shaw, P., 20:262
Davis, G., Lawrence Livermore National Laboratory safeguards and security quarterly progress report to the U.S. Department of Energy: Quarter ending June 30, 1994, 20:562 (R;US)
Davis, R.L., *See* Hall, L.E., 20:1263
See McKean, N.S., 20:1638
Davy, D.R., *See* Button, J.C.E., 20:832
Davydov, Yu.I., *See* Volod'ko, A.G., 20:1642
Day, R.A., *See* Vance, E.R., 20:1213
De Curtis, S., *See* Casalbuoni, R., 20:2132
de Loos, M.J., *See* van der Geer, B., 20:1524
De Lorenzo, D.S., Tank characterization reference guide, 20:418 (R;US)
De Vries, M.L., Sludge Stabilization Campaign blend plan, 20:338 (R;US)
Deandrea, A., *See* Casalbuoni, R., 20:2132
Decyk, V.K., *See* Sosenko, P.P., 20:2416
Dedonder, J.P., *See* Cannata, F., 20:2193
Dedovich, T.G., The properties of nucleon clusters production in (p, d) + Ta and (p, d) + C interactions over energy range from 4.2 to 10 GeV/c per nucleon, 20:2263 (R;XJ;In Russian)
Dees, L.A., Risk perception on management of nuclear high-level and transuranic waste storage, 20:311 (R;US)
DeFord, D.K., In situ sampling device development engineering task plan, 20:398 (R;US)
Degaltsev, Y., *See* Hoth, C.W,, 20:791
Degrange, J.P., *See* Lee, Y.K., 20:814
Degre, A., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Dehli, M., There's no way without cooling: All energy conversion processes produce waste heat, 20:732 (I;DE;In German)
Deimel, P., Evaluation of mechanical and technological parameters of different material states by nondestructive micro- and macromagnetic measuring quantities as well as ultrasonic techniques (2nd part of the project): Final report, 20:1118 (R;DE;In German)
Dejneka, T.G., Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)
Del Gandio, P., Toxic Chemical System (TCS), 20:1368 (R;US)
Delage, S.L., *See* Krynicki, J., 20:1219
Delamater, N.D., *See* Lindman, E.L., 20:2441
DeLand, S.M., *See* Badalamente, R.V., 20:558
Dell'Orco, P.C., *See* Flesner, R.L., 20:291
See Foy, B.R., 20:290
Della-Negra, S., *See* Boussofiane-Baudin, K., 20:2359
Delshad, M., *See* Pope, G.A., 20:95
Delzer, G., *See* Campbell, W.M., 20:6
Dem'yanov, A.V., Separated muon beams in the low-background laboratory of the JINR phasotron for studies involving the μSR-method, 20:1555 (R;XJ;In Russian)
Dempsey, N.M., *See* Wenhausen, P.A.P., 20:1121
Denecke, R., *See* Bocquet, A.E., 20:2321
Dengler, D., Use of specific microorganisms for in-situ sanitation of long-standing pollution sites: Final report, 20:623 (R;DE;In German)
Denner, A., Gauge-boson production in electron-photon collisions, 20:2114 (RA;DE)
See Beenakker, W., 20:2111
Dennis, R.A., Test results from the Department of Energy's pressurized fluidized bed combustion hot gas cleanup program, 20:18 (R;US)
Denschlag, H.O., Mainz University, Institute of Nuclear Chemistry. Annual report 1993, 20:1412 (I;DE;In German)
Deonigi, D.E., *See* Stenehjem, E.J., 20:933
Depauw, J., *See* Boussofiane-Baudin, K., 20:2359
Deptula, A., Process of formation of gels in the systems (Y^{3+}-Ba^{3+}-Cu^{2+}) or (Bi^{3+}-Pb^{2+}-Sr^{2+}-Ca^{2+}-Cu^{2+})-CH_3COO-NH_4OH-H_2O and theirs transformation to high temperature superconductors (HTS): $YBa_2Cu_3O_{7-x}$ (YBCO) $Bi_2Sr_2Ca_1Cu_2O_{8+\delta}$ (BSCCO 2212), Bi_2Sr_2 $Ca_2Cu_3O_{10+\delta}$ (BSCCO 2223) and $Bi_{1.6}Pb_{0.4}Sr_2$ $Cu_3O_{10+\delta}$ (BSCCO 2223), 20:1220 (IA;PL)
Derome, J., An observational study of the interaction between the synoptic-scale eddies and the intra-seasonal fluctuations in the atmosphere, 20:1711 (RA;US)
See Peng, S., 20:1731
Derou, D., A new paradigm for particle tracking velocimetry, based on graph-theory and pulsed neural network, 20:1462 (R;FR)
Derrick, M., Comparison of energy flows in deep inelastic scattering events with and without a large rapidity gap, 20:2145 (R;DE)
Deruaz, R., *See* Clement, P., 20:757
See Dumont, D., 20:758
See Noel, B., 20:759
DeSantis, G.N., Engineering task plan for steam line ramp calculations, 20:399 (R;US)
Desbois, J., *See* Fougere, F., 20:2022
Descroix, E., *See* Bedjidian, M., 20:2385
Desjarlais, A.O., Proceedings of the Low-Slope Reroofing Workshop: A review of the alternatives, 20:1430 (R;US)
Dessagne, Ph., *See* Bernas, M., 20:2251
See Czajkowski, S., 20:2246
Dettendorfer, J., Method for the transfer of genes in winter rape to plant breeders praxis: Final report, 20:617 (I;DE;In German)
DeVault, R.C., *See* Grossman, G., 20:1015
Devaux, A., *See* Bedjidian, M., 20:2385
Devendra, R., Test trial radiation vulcanization of natural rubber latex in Jakarta Indonesia, 20:586 (I;LK)
DeVore, R., *See* Clow, J., 20:502
Dewa, Hideki, Study of a double gapped buncher for proton linac, 20:1560 (RA;JP;In Japanese)
See Shirai, Toshiyuki, 20:1556
Dey, J., Zero sound velocity in π, ρ mesons at different temperatures, 20:2088 (R;XA)
Dey, M., *See* Dey, J., 20:2088
Dharmavanij, W., Application of prompt gamma ray neutron activation analysis, 20:611 (IA;TH;In Thai)
Thermal neutron capture gamma ray analysis with NaI(Tl) detector, 20:610 (IA;TH;In Thai)
Dhere, N.G., Polycrystalline $CuInSe_2$ and CdTe PV solar cells: Annual subcontract report, 15 April 1993–14 April 1994, 20:690 (R;US)
Diamandescu, L., *See* Ramer, R., 20:1209
Dias, M.P., Current status of SMPRs and manpower development for nuclear power, 20:798 (I;LK)
Dias, P.M., Current status of nuclear power development, 20:962 (I;LK)
DiCenso, A.T., Tank characterization report for double-shell Tank 241-AW-102, 20:394 (R;US)
Tank characterization report for double-shell Tank 241-AW-105, 20:395 (R;US)
See De Lorenzo, D.S., 20:418
Dickinson, D.R., *See* Epstein, M., 20:329
Didenko, L.A., *See* Dedovich, T.G., 20:2263

Didyk, A.Yu., *See* Wronski, W., 20:1662
Diegert, K.V., *See* Stohl, F.V., 20:52
Dietze, G., *See* Alberts, W.G., 20:1942
Dilger, H., Topological zero modes in Monte Carlo simulations, 20:2078 (R;DE)
Dilling, D.A., Modeling and analysis of heat transfer from the MHTGR core through a steel reactor vessel to the reactor cavity cooling system, 20:781 (RA;XA)
Passive decay and residual heat removal in the MHTGR, 20:777 (RA;XA)
Dills, H.E., *See* Stewart, J.R., 20:868
Ding, Yungui, Theoretical study of the noble metals on semiconductor surfaces and Ti-base shape memory alloys, 20:1146 (R;US)
Diop, C.M., *See* Bresard, I., 20:221
Ditmire, T., *See* Crane, J.K., 20:1510
Dittmaier, S., *See* Beenakker, W., 20:2111
See Denner, A., 20:2114
Dittrich, A., *See* Heber, U., 20:1963
Diver, R.B., *See* Andraka, C.E., 20:707
Dixit, V.B., *See* Carson, R.D., 20:14
Djemai, A.E.F., Quantum symplectic geometry. 1. The matrix Hamiltonian formalism, 20:1990 (R;XA)
Djouadi, A., Correlations in Higgs production and decay as a probe of CP-violation in the scalar sector, 20:2104 (RA;DE)
See Azuelos, G., 20:2134
See Barger, V., 20:2101
Dligatch, S., Determination of thin film optical constants using variable angle reflectance, 20:1275 (IA;AU)
Dobaczewski, J., *See* Gall, B., 20:2215
Dobelbower, M.C., *See* Negron, S.B., 20:151
Dobler, G., *See* Muehlbauer, W., 20:1045
Dobremelle, M., *See* Carvallo, G., 20:780
Dobrowolski, A., *See* Chmielewski, A.G., 20:595
Doctor, R.D., Gasification combined cycle: Carbon dioxide recovery, transport, and disposal, 20:59 (R;US)
Dodd, D.A., *See* Rebagay, T.V., 20:420
Dodson, K.E., *See* Bronson, M.C., 20:321
Doerry, A.W., Synthetic aperture radar processing with polar formatted subapertures, 20:1667 (R;US)
Dohi, Kiyohiko, *See* Ito, Takashi, 20:1931
See Seyama, Toshio, 20:1932
Dolan, B.W., *See* Vanden Heuvel, L.N., 20:875, 20:876
Dolan, T.J., Assessment of database for interaction of tritium with ITER plasma facing materials, 20:2436 (R;US)
Dolenc, M.R., *See* Wood, D.E., 20:238
Dominici, D., *See* Casalbuoni, R., 20:2132
Dong, X.L., *See* Sun, D.Z., 20:1181
Donskov, S.V., The slow proton position-sensitive time of flight detector of the GAMS NA12/2 experiment at CERN, 20:1585 (R;FR)
Donzaud, C., *See* Bernas, M., 20:2251
Dooley, S.P., Transverse microanalysis of 2.5 MeV H^+ damage in diamond, 20:2355 (IA;AU)
Dorchak, T., *See* Damle, A.S., 20:17
Dorfer, J., *See* Franz, K., 20:622
Dorier, J.L., *See* Courteille, C., 20:2418
Dotsenko, I.S., *See* Filippov, G.F., 20:2229
Dotsenko, V.I., *See* Rusanov, K.V., 20:1231
Dou, S.X., Fabrication and properties of long Bi2223 Ag-sheathed superconducting tapes, 20:1120 (IA;AU)
See Guo, Y.C., 20:1193
See Ionescu, H.M., 20:1204
See Li, Hongshuo, 20:1131, 20:1133
See Liu, H.K., 20:1192
See Matthews, D.N., 20:1206
See Muller, K.H., 20:2382
See Xia, J.A., 20:1194
See Xu, Jianmin, 20:1124
See Yau, J., 20:2381
See Yavuz, M., 20:1186
Doyle, B.L., *See* Lee, S.R., 20:1673
Drapier, O., *See* Bedjidian, M., 20:2385
Drebushko, A.E., *See* Dem'yanov, A.V., 20:1555
Dresel, P.E., Hanford Site ground-water monitoring for 1993, 20:466 (R;US)
Dresselhaus, M.S., *See* Farmer, J.C., 20:1004
Drielinger, I., *See* Adewumi, M.A., 20:128
Drinkard, J., The D0 Level 1.5 Calorimeter Trigger, 20:1624 (R;US)
Droemer, D., *See* Bellman, R., 20:928
Dromby, G., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Drummond, T.J., *See* Lee, S.R., 20:1673
Dryer, F.L., Fundamental studies of fuel chemistry as related to internal combustion engine phenomena: Technical progress report, July 1, 1988–June 30, 1989, 20:130 (R;US)
Duann, D.J., Restructuring local distribution services: Possibilities and limitations, 20:138 (R;US)
Duarte, C.L., An improved method for determination of uranium isotopic composition in urine by alpha spectrometry, 20:1300 (I;BR)
Dubinin, M.N., *See* Boos, E.E., 20:2142
Dubois, J.F., *See* Joly, C., 20:823
Duchac, A., System of NPP personnel training in Slovak Republic, 20:2508 (RA;XA)
Duchsherer, M.J., CEL Working procedures for WRAP 2A formulation development test, 20:362 (R;US)
Dueerkop, A., Combined cycle (CC) power station in the 250-MW power range with integrated coal gasification according to MBG technology: Final report, 20:731 (I;DE;In German)
Duffey, T.A., *See* Glass, R.E., 20:1119
Dugas, B., *See* Peng, S., 20:1731
Dugovic, M., *See* Duchac, A., 20:2508
Duignan, M.R., Experiences in the dry storage of aluminum-clad spent nuclear fuels, 20:210 (R;US)
Dukelow, G.T., *See* Pulsipher, B.A., 20:310
Dumont, D., Loss of residual heat removal during mid-loop operation: Bethsy experiments, 20:758 (R;FR)
Duncan, A., Zirconium X-ray emission spectra by an electron probe micro analyser, 20:2286 (IA;AU)
Dunn, P.S., Tungsten-uranium penetrator target interaction, 20:1156 (R;US)
Dunn, T.D., Impact of increasing MHTGR power on passive heat removal, 20:778 (RA;XA)
See Dilling, D.A., 20:781
Dunn, W.N., A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores, 20:2556 (R;US)
Duong Quoc Viet, On the Cohen-Macaulayness and Gorensteinness of integral closure filtrations Rees algebras of height-two equimultiple ideals, 20:1981 (R;XA)
The criteria for the Cohen-Macaulayness and Gorensteiness of Rees algebras of ideals having positive analytic deviation, 20:1984 (R;XA)
Duran, F.A., *See* Price, L.L., 20:316
Durant, J.L. Jr., *See* Paul, P.H., 20:1424
Dusek, J.T., *See* Balachandran, U., 20:134
Dutta, J., *See* Courteille, C., 20:2418
Dutton, S., *See* Tyler, N., 20:99
Duval, M.A., *See* Frascaria, R., 20:2252
Dvali, G., Semiglobal Alice strings, 20:2044 (R;XA)
Dybczynski, R., *See* Danko, B., 20:1323
See Kulisa, K., 20:591
See Wasek, M., 20:1324
Dyson, A.J., Empirical molecular dynamics calculations for the (001) and (111) reconstructed surfaces of diamond, 20:2325 (IA;AU)
Dytlewski, N., *See* Martin, J.W., 20:1637
See Walker, S.R., 20:2330
Dzhincharadze, D.G., *See* Volod'ko, A.G., 20:1642
Dziedzic-Goclawska, A., *See* Stachowicz, W., 20:1395, 20:1396, 20:1402
Dziewonski, Z., Multi-points mobile radiotracer laboratory, 20:604 (IA;PL)
Dzilinski, K., EPR studies of reduced Zn-chlorins and their isotope substituted analogs, 20:1904 (IA;PL)
Dzyuba, Yu.G., *See* Amirkhanov, I.V., 20:2545

E

Eadie, W.J., Verification and validation of DEPOSITION 2.0, 20:1657 (R;US)
Early, J.W., *See* Shimada, Tsutomu, 20:1765
Eaton, R.R., *See* Finger, J.T., 20:712
Eaves, L., *See* Lerch, M.L.F., 20:2344
Ebers, M.L., *See* Mortimore, J.A., 20:461, 20:463, 20:464
Ebert, S., *See* Worbs, M., 20:70
Eboli, O.J.P., Invisibly decaying Higgs boson at e^+e^- collisions, 20:2105 (RA;DE)
Eckels, D.E., *See* Buttermore, W.H., 20:71
Eckhardt, E., *See* Cramer, G., 20:1059
Eckstein, R., *See* Bocquet, A.E., 20:2321
Ederhof, A., Further development of the seven-hole probe technique for steady flow measurements: Final report, 20:1472 (R;DE;In German)
Edge, R., Quality assurance, documentation, and long-term monitoring, 20:484 (RA;US)
Ediriweera, R.N., Stability of polypyrrole tapes at high current densities, 20:1267 (IA;AU)
Thermal characteristics of electric cables with polypyrrole coated conductors, 20:1274 (IA;AU)
Edis, R., Alligator Rivers Analogue project. Groundwater Chemistry: Final Report - Volume 7, 20:1802 (I;AU)
See Isobe, H., 20:1803
Edis, Robert, The effect of weathering on the distribution of uranium and associated elements at Koongarra, Northern Territory, Australia, 20:1806 (I;AU)
Edwards, D.D., *See* Bartholomay, R.C., 20:1785
See Cecil, L.D., 20:1784
Edwards, R.E., Recovery of phosphates from elemental phosphorus bearing wastes, 20:1036 (R;US)
Efimov, G.V., *See* Burdanov, Ya.V., 20:2095, 20:2096
Efremov, A., The twist-3 single spin asymmetries of pion production, 20:2087 (R;XA)
Eggerstedt, P.M., IF&P Fibrosic™ filters, 20:61 (R;US)
Eggington, W.J., Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas, 20:120 (R;US)
Ehret, K., *See* Hast, C., 20:1602
Ehrhardt, A., *See* Bett, A., 20:683
Ehrke, L., *See* Hiergesell, R.A., 20:477
Ehrlich, K., *See* Borgstedt, H.U., 20:1113
Ehrlichmann, H., *See* Albrecht, H., 20:2144
Eichholz, G.G., *See* Carlton, W.H., 20:1778
Eid, M., Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)
Eikenberg, J., Grimsel test site: preparation and performance of migration experiments with radioisotopes of sodium, strontium and iodine, 20:1832 (R;CH)
Eisele, T.C., *See* Kawatra, S.K., 20:68
Eisenbart, J., Cost optimization of mine design by means of filled stoping: Final report, 20:75 (R;DE;In German)
Eismann, P.H., *See* Walker, E.W. Jr., 20:1461
El-Waged, Kh., Do fragment multiplicity distributions obey any kind of scaling ?, 20:2232 (R;XJ)
Regge theory inspired model on nuclear destruction in high energy nucleus-nucleus interactions, 20:2231 (R;XJ)
Elbanowski, H., *See* Szyczewski, A., 20:1354
Elcombe, M.M., *See* Argyriou, D.N., 20:2334
Eldarov, M., *See* Larionov, V., 20:1866
Elder, J., *See* Clow, J., 20:502
Eldessouky, A.M., *See* Souka, N., 20:159
ELguebelly, S., *See* Saad, S.M., 20:2287
Elliott, N.E., *See* Gobby, P.L., 20:2442
Elkhalafawy, T.A., *See* Masoud, M.M., 20:2399, 20:2400
See Soliman, H.M., 20:2401
Ellegaard, C., *See* Rousteau, S., 20:2161
Eller, S.W., Environmentally Conscious Manufacturing Project: Maine metal products association: [Quarterly] status report, July 1–September 30, 1994, 20:1039 (R;US)
Elliot, S., *See* Tonn, B., 20:1826
Ellis, J., A string derivation of the $ matrix, 20:2062 (R;FR)
Ellis, J.E., *See* Kiebel, G.R., 20:1457
Ellis, T.W., A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
Methods and opportunities in the recycling of rare earth based materials, 20:1144 (R;US)
Elmasry, M.A.A., Electrochemical recovery of iron from iron and steel pickling wastes, 20:1339 (R;EG)
Inventory calculation for an irradiated HTGR fuel element, 20:768 (R;EG)
Size and surface AREA analysis of some metallic and intermetallic powders, 20:1292 (R;EG)
Elphinstone, R., *See* Shapshak, M., 20:2425
Elsayed, A.A., *See* Abdelhalim, A.S., 20:146
See Elmasry, M.A.A., 20:1292, 20:1339
Elsener, M., *See* Koebel, M., 20:1087
Elsourgy, A.A., *See* Fouad, M.F., 20:2224
Elswefy, F.H., *See* Souka, N., 20:159
Ely, J., *See* Foy, B.R., 20:290
Emerson, D.W., Alligator Rivers Analogue project. Geophysics, petrophysics and structure: Final Report - Volume 4, 20:145 (I;AU)
Emling, H., *See* Anne, R., 20:2248
Emoto, T., *See* Hirano, K., 20:1578
Engel, J.A., *See* Kirkendall, J.R., 20:247
Engelfried, J., The E781 trigger and data acquisition system, 20:1623 (R;US)
Engelhardt, M.E., Events in time: Basic analysis of Poisson data, 20:803 (R;US)
Engrand, P., *See* Turinsky, P.J., 20:801
Engvik, L., Asymmetric nuclear matter and neutron star properties, 20:2223 (R;NO)
Enomoto, Atsushi, *See* Hanaki, Hirofumi, 20:1575
See Yamaguchi, Seiya, 20:1576
Enomoto, Katsuhiko, *See* Mori, Michio, 20:1934
Enomoto, R., Measurement of the $D^{*\pm}$ cross section using a soft-pion analysis in two-photon processes, 20:2172 (RA;JP)
Epstein, M., Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout, 20:329 (R;US)
Epstein, MM., Industrial opportunities for solar tower technologies in Israel, 20:652 (IA;IL)
Erdman, W.W., *See* Grossman, J.W., 20:706
Eremin, A.V., *See* Andreev, A.N., 20:2265
Erickson, J.L., *See* Yuan, V.W., 20:1588
Erickson, T.A., *See* Benson, S.A., 20:63
Ernst, J., *See* Frascaria, R., 20:2252
Ersez, T., Diffuse neutron scattering studies of single crystal specimens of Fe_{3-x} Mn_x Si, 20:1123 (IA;AU)
Esch, M., *See* Bengtsson, L., 20:1753
Eska, G., Unexpected observations in metals at very low temperatures, 20:2317 (IA;AU)
Espagnon, B., *See* Bedjidian, M., 20:2385
Estes, G.P., Supertrack Monte Carlo variance reduction experience for non-Boltzmann tallies, 20:1650 (R;US)
Etheridge, G.T., Spin glass behaviour in (Mn, Mg)S, 20:1270 (IA;AU)
Etnier, E.L., Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
Eto, J.H., *See* Sezgen, A.O., 20:991
Ettenhuber, E., Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey, 20:1910 (RA;US)
Eubank, L.D., Technical Department report on Production Test No. 313-70-M: Behavior of Paul and Beekman cans washed and unwashed, 20:864 (R;US)
Evaldi, R.D., Streamflow, specific-conductance, and temperature data for Bayou and Little Bayou Creeks near Paducah, Kentucky, August 15 and 16, 1989, 20:454 (R;US)
Evans, A.J., *See* Cronauer, D.C., 20:22
Evans, C.R., *See* Yu, N., 20:1237
Evans, C.S., M-Area Hazardous Waste Management Facility groundwater monitoring report – Fourth quarter 1993 and 1993 summary: Volume 2, 20:474 (R;US)
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)

Evans, J.C., *See* Dresel, P.E., 20:466
Evans, L.C., Minutes of Technical Division Steering Committee Meeting December 13, 1955, Savannah River Laboratory, 20:254 (R;US)
Minutes of Technical Division steering committee meeting August 11, 1953, Wilmington, 20:841 (R;US)
Minutes of Technical Division Steering Committee Meeting, May 10, 1955, Savannah River Laboratory, 20:844 (R;US)
Evans, L.R., *See* Ghanbari, C., 20:702
Evans, P.J., *See* Martin, J.W., 20:1217
Evans, R.A., Radiological design guide, 20:1455 (R;US)
Evers, F.H., *See* Seufert, G., 20:1810
Evstatiev, D., Site selection procedure for high level radioactive waste disposal in Bulgaria, 20:279 (I;BG)
Evtushenko, I.A., MHD-flow in slotted channels with conducting walls, 20:2430 (R;US)
The effect of a magnetic field on heat transfer in a slotted channel, 20:2429 (R;US)
Ewing, R.C., *See* Isobe, H., 20:1803

F

Fabryka-Martin, J.T., Alligator Rivers Analogue project. Geochemistry of ^{239}Pu, ^{129}I, ^{99}Tc and ^{36}Cl: Final Report - Volume 15, 20:1805 (I;AU)
Fadeff, S.K., Radiochemistry methods in DOE methods for evaluating environmental and waste management samples, 20:1334 (R;US)
Faillace, E.R., RESRAD benchmarking against six radiation exposure pathway models, 20:1906 (R;US)
Faiman, D., *See* Berman, D., 20:646, 20:647
See Biryukov, S., 20:648
Fajman, V., Spent nuclear fuel in the Czech Republic, 20:272 (RA;XA)
Falconer, I.S., *See* Khachan, J., 20:1253
Faltens, A., *See* Bangerter, R.O., 20:2445
Fan, L.T., *See* Chen, Wei-Yin, 20:69
Fancher, J.D., *See* Richterich, L.R., 20:1496
Fang Hai-ping, Symbolic dynamics of the Lorenz equations, 20:2015 (R;XA)
Fanous, F., *See* Greimann, L., 20:879
Farafontov, G., *See* Guzhovskii, B., 20:2267
Fargeix, J., *See* Bedjidian, M., 20:2385
Farina, G.E., *See* Hester, R.D., 20:627
See Nguyen, D.T., 20:1167
Farmer, J.C., Sputter deposition of multilayer thermoelectric films: An approach to the fabrication of two-dimensional quantum wells, 20:1004 (R;US)
Farquharson, G., *See* Siman-Tov, M., 20:863
Farr, J.D., *See* Paffett, M.T., 20:1763
Farrell, B.F., *See* Ioannou, P.J., 20:1723
Farvaque-Bera, A.M., Electrochemical corrosion studies on a selected carbon steel for application in nuclear waste disposal containers: Influence of radiolytic products on corrosion in brines, 20:1153 (R;DE)
Fassbender, A.G., *See* Robertus, R.J., 20:304
Fast, J.D., The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)
Faure, F.X., *See* Turinsky, P.J., 20:801
Fauske, H.K., *See* Epstein, M., 20:329
Faust, H.R., *See* Bernas, M., 20:2251
Fayers, F.J., Productivity and injectivity of horizontal wells: Annual report, March 10, 1993–March 9, 1994, 20:113 (R;US)
Feher, G., Toms Creek Integrated Gasification Combined-Cycle Demonstration Project: Quarterly report, April–June, 1994, 20:728 (R;US)
See Ghazanfari, R., 20:7
Feigenbutz, L.V., Test procedure forms for sludge retrieval and packaging, 20:349 (R;US)
Felde, D.K., *See* Siman-Tov, M., 20:863
Feldman, M.R., *See* Anderson, J.C., 20:1429
Feldman, U., X-ray spectroscopy of xenon: Final report, 20:2281 (R;US)
Fell, C.J., Ion beam mixing of isotopic bilayers, 20:1136 (IA;AU)
Felmy, A.R., *See* Rai, D., 20:306
Femec, D.A., SWEPP Gamma-Ray Spectrometer System software design description, 20:257 (R;US)
SWEPP gamma-ray spectrometer system software user's guide, 20:258 (R;US)
Fendler, J.H., *See* Zhao, X.K., 20:2311
Feng, Jianren, Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes, 20:1370 (R;US)
Feng, X., Effects of glass surface area-to-solution volume ratio (S/V) on glass dissolution: Part one: Relationship between S/V and leachate pH, 20:217 (R;US)
Ferekides, C.S., *See* Morel, D.L., 20:687
Fermandez, J.C., *See* Gobby, P.L., 20:2442
Fernandez, F.N., The use of DBMS and document oriented interface in the TPLAN-system, 20:2544 (R;XJ)
Fernandez-Baca, J.A., *See* Wang, X.L., 20:1174
Ferreira, L., *See* Pope, G.A., 20:95
Ferrell, P.C., *See* Adkins, H.E., 20:1005
Ferretti, S., *See* Franz, K., 20:622
Ferri, M.A., Current distribution in Cable-In-Conduit Conductors, 20:2433 (R;US)
Ferris, R.H., *See* Richterich, L.R., 20:1496
Ferron, J.R., Method and apparatus for high speed data acquisition and processing, 20:2555 (PA;US)
Fiderkiewicz, A., *See* Buczkowski, M., 20:598
Fields, B.C., *See* Harrach, R.J., 20:515
Fierz, T., *See* Eikenberg, J., 20:1832
Filatov, I.V., *See* Dzilinski, K., 20:1904
Filippone, C.L., Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring, 20:289 (R;US)
Filippov, G.F., The microscopical two axial rotators model for the nucleus with the different neutron and proton shell configurations, 20:2229 (R;UA;In Russian)
The Realization of the Resonating Group Method Algebraic Version for Three-Cluster Systems., 20:2217 (R;UA)
Filtopoulos, E.E.J., *See* Schefer, R.W., 20:1426
Finalayson, T.R., *See* Liu, M., 20:1130
Finger, J.T., Steamboat Hills exploratory slimhole: Drilling and testing, 20:712 (R;US)
Fink, S., Microscopical aspects of foliar alterations in declining trees, 20:1960 (IA;DE)
Finlayson, T.R., *See* Batchelor, W.J., 20:2333
See Kelly, G.L., 20:1190
See Long, G.M., 20:2336
See Lowe, D.B., 20:2371
See Oliver, D.R., 20:1122
Finne, T.E., *See* Chekushin, V.A., 20:1823
Finnemore, D.K., In-situ X-ray study of freezing and melting of Bi(2212) and Bi(2223), 20:1187 (IA;AU)
Firganek, H., *See* Ciurapinski, A., 20:1485
Fisch, N.M., *See* Malatidis, N.A., 20:704
Fischer, E.M., *See* Judkins, R.R., 20:1492
Fischer, H., *See* Deimel, P., 20:1118
Fischer, I.S., *See* Rosato, A.D., 20:1671
Fischer, L.E., *See* Anderson, B.L., 20:1442
See Chen, T.F., 20:1250
Fish, J.H. III, *See* Tessmer, R.G. Jr., 20:1040
Fish, W., Anionic co-contaminants and the biogeochemical evolution of aquifer heterogeneity: Technical progress report, 1 August 1993–31 July 1994, 20:1781 (R;US)
Fisher, C.H., *See* Pogorelsky, I.V., 20:1516
Fisher, D., Lifetime and bistability in electron tunneling in a double barrier structure, 20:2394 (IA;AU)
See Weiner, D., 20:680
Fisher, P., *See* Baker, R.J., 20:2285
See Piao, G., 20:1264
Fishman, B., Meso-scale cooling effects of high albedo surfaces: Analysis of meteorological data from White Sands National Monument and White Sands Missile Range, 20:1822 (R;US)
Fishman, H., *See* Goeler, S. von, 20:2421
Fisk, Z., *See* Cooley, J.C., 20:1232

Fitzsimmons, J.R., A Shock-Hugoniot for YBa_2 Cu_3 O_7 powder, 20:1184 (IA;AU)
Flambaum, V.V., The hole-hole superconducting pairing in the t-J model induced by long-range spin-wave exchange, 20:2366 (IA;AU)
Fleck, S., Limits on the window for halo phenomena, 20:2002 (R;FR)
Flesner, R.L., Base hydrolysis and hydrothermal processing of PBX-9404, 20:291 (R;US)
Fletcher, J.F., *See* Short, S.M., 20:511
Flocard, H., *See* Gall, B., 20:2215
Florkowski, T., Nuclear technology in hydrological and environmental research, 20:589 (IA;PL)
Floro, J.A., *See* Kellerman, B.K., 20:1286
Flowers, L., Village power hybrid systems development in the United States, 20:1001 (R;US)
Foch, J.D., *See* Christon, M.A., 20:1452
Foley, C.P., Josephson behaviour and flux trapping effects in YBCO step edge junctions, 20:2378 (IA;AU)
See Jenkins, B., 20:1185
See Sloggett, G.J., 20:2383
Foley, R.D., Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V), 20:504 (R;US)
Results of the radiological and beryllium verification survey at the Peek Street Site, Schenectady, New York (SY001V), 20:505 (R;US)
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)
Folkerts, L., *See* Meyer, F.W., 20:2347
Fontaine, T.A., *See* Moore, T.D., 20:227
Force, P., *See* Bedjidian, M., 20:2385
Forconi, G., *See* Beingessner, S.P., 20:1584
Foreman, R.J., *See* Farmer, J.C., 20:1004
Forest, E., *See* Sullivan, M., 20:1609
Forni, L., *See* Oliva, C., 20:1351
Forshaw, J.R., Uncertainties in in calculations of the $\gamma\gamma$minijet cross section, 20:2140 (RA;DE)
See Miller, D.J., 20:1619
Forslund, C.R.J., *See* Hauth, J.T., 20:549
Forsman, K., *See* Kettunen, L., 20:2524, 20:2525
Forsyth, A.G., Relativistic quantum mechanics in a periodic potential, 20:1991 (IA;AU)
Fortier, S., *See* Rotbard, G., 20:2244
See Vernotte, J., 20:2250
Forty, R.W., Experimental requirements for the study of electroweak gauge bosons, 20:1618 (RA;DE)
Foster, G.W., Multi-batch P-bar production via snap coalescing: A plan to produce ~5× more antiprotons/cycle using mostly existing equipment, 20:1549 (R;US)
Foster, H., *See* Campbell, J.A.L., 20:11
Foster, I.T., FORTRAN M: A language for modular parallel programming, 20:2530 (R;US)
Foster, J.C. Jr., *See* Maudlin, P.J., 20:1154
Foster, P., *See* Shepodd, T.J., 20:1688
Foster, R.F., Progress report on O2 research and development Mission 14: Columbia River studies, July–December 1966, 20:834 (R;US)
Fouad, M.F., Determination of relative efficiency of a GMX-detector, 20:2224 (R;EG)
Fouaidy, M., Thermal behaviour analysis of SRF cavities and superconducting HOM couplers: Numerical simulation and experimental results, 20:1554 (R;FR)
Fougere, F., Moments of inertia and the shapes of Brownian paths, 20:2022 (R;FR)
Fox, G.L., Hazard assessments of double-shell flammable gas tanks, 20:533 (R;US)
Fox, J.D., Operation and performance of a longitudinal damping system using parallel digital signal processing, 20:1612 (R;US)
Foy, B.R., Reduction of nitrate and nitrite salts under hydrothermal conditions, 20:290 (R;US)
Frain, J.M., Accelerated clean-up at the Hanford Site, 20:520 (R;US)
Francis, C.W., Uranium removal from soils: An overview from the Uranium in Soils Integrated Demonstration program, 20:223 (R;US)
Francis, P.M., Test plan for core sampling drill bit temperature monitor, 20:534 (R;US)
Franconi, E.M., *See* Sezgen, A.O., 20:1020
Frank, C., *See* Peterson, M.E., 20:922
Frank, M., A precision measurement of the branching ratio $\Gamma_{bar{b}b}/\Gamma_{had}$ in the e^+e^- annihilation on the Z^0 resonance, 20:2180 (R;DE;In German)
Frank, N.W., *See* Zimek, Z., 20:601
Frankel, N.E., *See* Bardos, D.C., 20:2428
See Daicic, J., 20:2069, 20:2070, 20:2072, 20:2398
See Kowalenko, V., 20:2003
Franklin, J.D., *See* DiCenso, A.T., 20:394, 20:395
Franse, J.J.M., *See* Li, J.N., 20:2379
Franz, E.M., Proposed waste form performance criteria and testing methods for low-level mixed waste, 20:240 (R;US)
Franz, K., Investigation on continuous ethanol production using Zymomonas mobilis: Final report, 20:622 (I;DE;In German)
Franzke, B., *See* Kluge, H.J., 20:1630
Frascaria, N., Multiphonon excitations in nuclei built with giant resonances, 20:2211 (R;FR)
Frascaria, R., Total d+d → $\alpha+\eta$ cross sections near threshold, 20:2252 (R;FR)
Freeburn, H.R., *See* Smith, G.P. Jr., 20:762
Freeman, R.D., *See* DeSantis, G.N., 20:399
Freeth, C.A., *See* Baker, R.J., 20:2285
Freitas, R., On the prediction of flooding phenomenon with the Cathare code, 20:748 (R;FR)
Freitas, R.L., *See* Kelly, J.M., 20:1465
Frentrup, W., *See* Hartman, A., 20:2395
Freund, R.W., A new Krylov-subspace method for symmetric indefinite linear systems, 20:2552 (R;US)
QMRPACK and applications, 20:2551 (R;US)
QMRPACK user's guide, 20:2553 (R;US)
Frick, U., *See* Eikenberg, J., 20:1832
Fricke, K.E., The February 21, 1993 tornadoes of East Tennessee, 20:544 (R;US)
Friend, C.M., Model studies of hydrodesulfurization by Mo: The effect of promoters: Progress report, December 1, 1993–November 30, 1994, 20:1294 (R;US)
Frithjof, S., *See* Rheinlander, J., 20:674
Fritsche, U., *See* Buchert, M., 20:1760
Fromm, E., *See* Borgstedt, H.U., 20:1113
Front, K., *See* Okko, O., 20:1841
Fruchter, J.S., Manipulation of natural subsurface processes: Field research and validation: Interim report, 20:510 (R;US)
Fuchs, N.H., *See* Knecht, M., 20:2194
See Stern, J., 20:2195
Fuck, R.A., Rb-Sr measurements on metamorphic rocks from the Barro Alto Complex, Goias, Brazil, 20:1301 (I;BR)
Fuhrmann, M., *See* Franz, E.M., 20:240
Fujisawa, Hiroshi, *See* Iwashita, Yoshihisa, 20:1557
Fujita, Fumiyuki, *See* Sawamura, Sadashi, 20:606
Fujita, Hirokazu, *See* Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Fujiwara, Tomoharu, *See* Sawamura, Sadashi, 20:606
Fukahori, Tokio, Status of intermediate energy nuclear data, 20:2254 (RA;JP)
Fukazawa, Akio, Heat transfer tests by slice model of high performance spent fuel shipping cask, 20:1438 (IA;JP)
Fuketa, Toyoshi, Behavior of pre-irradiated fuel under a simulated RIA condition: Results of NSRR test JM-3, 20:817 (R;JP)
Fukuda, S., *See* Sano, Y., 20:1070
Fukuda, Shigeki, *See* Michizono, Shinichiro, 20:1567
Fukutsu, Kumiko, *See* Otsu, Hiroshi, 20:1925
Fuoto, J.S., *See* Benbennick, M.E., 20:567
Furdyna, J., *See* Chen, A.L., 20:1283
Furlanetto, M.R., *See* Paul, P.H., 20:1424
Furlong, M.W., *See* Cronauer, D.C., 20:22
Furubayashi, M., *See* Sano, Y., 20:1070
Furuse, Takeshi, *See* Otsu, Hiroshi, 20:1925
Fyfe, J., Synoptic scale eddies in the Northern Hemisphere summer: A POP analysis, 20:1719 (RA;US)
Fyodorov, A.A., *See* Korzhik, M.V., 20:1282

G

Gaafar, M.A., *See* Bishay, S.T., 20:840
Gabrielli, E., *See* Baillargeon, M., 20:2102
Gadallah, A.A., Nuclear fuel cycles : description, demand and supply estimates, 20:795 (R;EG)
Gaddis, L.A., *See* Brevick, C.H., 20:385, 20:386, 20:387, 20:389, 20:390, 20:391, 20:392, 20:393
Gaertner, R., Corrosion investigations on austenite chromium/nickel steels by electrochemical methods and photoelectron spectrometry, 20:1116 (I;DE;In German)
Gaeta, M.J., CHEMCON user's manual: Version 1.1, 20:2435 (R;US)
See Merrill, B.J., 20:2437
Gagarinski, A., Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)
Gahir, S.S., *See* Hunacek, G.S., 20:470
Gallis, R.M., *See* Daicic, J., 20:2069
Gallard, J.M., Fibre tracking: An overview, 20:1648 (R;FR)
See Basa, S., 20:1647
Gaiser, P., *See* Coutelle, R., 20:719
Gales, S., Statistical and direct decay of high-lying single-particle excitations, 20:2210 (R;FR)
See Rotbard, G., 20:2244
Gall, B., Superdeformed rotational bands in the Mercury region: A cranked Skyrme-Hartree-Fock-Bogoliubov study, 20:2215 (R;FR)
Gallup, D.R., *See* Mancini, T.R., 20:667
Gamble, R.M., A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)
Gamboa, J., The no-hair conjecture in 2D dilaton supergravity, 20:2090 (R;FR)
Gamchi, H.S., Variable range hopping conductivity in $Y_1$23:$Y_2$11 composites close to the percolation limit, 20:1202 (IA;AU)
Ganakas, G., *See* Jinks, D., 20:2337
Gangwal, S.K., *See* Damle, A.S., 20:17
Ganor, J., *See* Lasaga, A.C., 20:287
Gant, R.G., 105KE and 105KW Basins fuel and sludge consolidation study, summary report, 20:347 (R;US)
Gantenbein, F., *See* Brochard, D., 20:789
Gao Zuying, Afterheat removal for HTR-10 test module under accident conditions, 20:775 (RA;XA)
Garcia, A.E., Multi-basin dynamics of a protein in aqueous solution, 20:1867 (R;US)
See Hummer, G., 20:1868
Garcia, M.M., *See* Hyde, R.A., 20:498
Gartling, D.K., COYOTE II - a finite element computer program for nonlinear heat conduction problems: Part I - theoretical background, 20:1477 (R;US)
Garton, D.B., *See* Martin, J.W., 20:1637
Gaslightwala, A.F., *See* Chipman, D.W., 20:1857
Gates, T.A., Small job development software project documentation for the activity management system: Revision 1, 20:342 (R;US)
Gatti, E., *See* Rehak, P., 20:1617
Gatto, R., *See* Casalbuoni, R., 20:2132
Gatzweiler, R., Uranium deposits and production in Eastern Europe and the former Soviet Union, 20:142 (RA;US)
Gauron, P., On the coherence between high-energy total cross-section data when compared with general principles, 20:2165 (R;FR)
Gavin, S., Summary of heavy ion theory, 20:2233 (R;US)
Gavron, A., *See* Lisowski, P.W., 20:1587
Gay, T.J., Experimental investigations of electron capture from atomic hydrogen and deuterium by alpha particles: Final report, September 15, 1984–September 14, 1993, 20:2403 (R;US)
Gebel, B., *See* Wenhausen, P.A.P., 20:1121
Gehrke, J.W., B Plant cleanout and stabilization program update, 20:532 (R;US)
B Plant: WESF location study, 20:530 (R;US)
Geiss, H., *See* Kley, D., 20:1756
Geissel, H., *See* Czajkowski, S., 20:2246
Geist, D.R., Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
Gentzlinger, R.C., *See* Black, S.J., 20:1002
George, M.A., Mercuric iodide research and development in support of DOE Historically Black Colleges and University Program: Semiannual technical progress report, 20:1621 (R;US)
George, T.G., Monthly progress report heat source technology programs, June 1994, 20:612 (R;US)
Georgelin, Y., *See* Gamboa, J., 20:2090
Georgeot, B., *See* Comtet, A., 20:1992
Georgeton, G.K., Characterization of hazardous constituents in HLW supernate and implications for solid LLW generation, 20:437 (R;US)
Gerat, L.M., *See* Eid, M., 20:769
Gerig, R., *See* Mao, N., 20:1540
Gernoth, K.A., Correlated density matrix theory of spatially inhomogeneous Bose fluids, 20:2388 (R;XA)
The surface of liquid ^{4}He at nonzero temperatures, 20:2389 (R;XA)
Gerschel, C., Vector meson production at CERN, 20:2247 (R;FR)
Gerstner, E.G., Fabrication and characterisation of thin film tetrahedral amorphous carbon, 20:1256 (IA;AU)
Gerzon, S., *See* Akhundov, A.A., 20:2160
Getino, C., A neural network approach to the study of dynamics and structure of molecular systems, 20:2280 (R;US)
Ghanbari, C., Recent National Solar Thermal Test Facility activities, in partnership with industry, 20:702 (R;US)
Ghassemi, B., *See* Gamble, R.M., 20:811
Ghazanfari, R., Enviropower hot gas desulfurization pilot, 20:7 (R;US)
Ghil, M., *See* Strong, C., 20:1735
Ghinculov, A., Anomalous selfinteractions of gauge bosons in WWZ and ZZZ production at NLC, 20:2118 (RA;DE)
Ghirardi, G.C., Describing the macroscopic world: Closing the circle within the dynamical reduction program, 20:1978 (R;XA)
Testing quantum behaviour at the macroscopic level, 20:1986 (R;XA)
Ghose, S.K., *See* Dilling, D.A., 20:777, 20:781
Giamberardini, S.J., 308 Building electrical load list and panel schedules, 20:886 (R;US)
Giannikos, A., *See* Wolf, L., 20:785
Giannoni, M.J., Coding chaotic billiards. Pt. 2: Compact billiards tiling the pseudosphere, 20:1994 (R;FR)
See Ullmo, D., 20:1995
Gibert, R.J., *See* Brochard, D., 20:789
Gidaspow, D., Predictive models of circulating fluidized bed combustors: 14th Technical progress report, 20:87 (R;US)
Gieres, F., Supersymmetry and Mathematics, 20:2065 (R;FR;In French)
Gilbert, B.C., ESR studies of the generations and reactions of free radicals in chemical and biochemical systems, 20:1384 (IA;PL)
Gilbert, W., Construction of an integrated database to support genomic sequence analysis, 20:1864 (R;US)
Gillen, D.M., The Uranium Mill Tailings Radiation Control Act and its implementation from a regulatory perspective, 20:483 (RA;US)
Gillham, T.H., West Hackberry Tertiary Project annual technical progress report, September 3, 1993–September 2, 1994, 20:117 (R;US)
Gilon, Y., *See* Kenan, G., 20:659, 20:660
Gimera, M., Software quality assurance plan for viscometer, 20:407 (R;US)
Software quality assurance plan for void fraction instrument, 20:408 (R;US)
Ginniff, M.E., Nuclear information and education experience in the United Kingdom, 20:960 (I;XA)
Public information and education in England, 20:945 (I;XA)
Ginot, P., The management of site contamination, 20:1701 (IA;PL)
Girard, C.J., *See* Baker, J.B.H., 20:2315
Glantz, C.S., *See* Short, S.M., 20:511
Glass, R.E., Impact-limiting materials characterization, 20:1119 (IA;JP)
Glendenning, N.K., *See* Weber, F., 20:2025
Glines, W.M., *See* Black, S.C., 20:241, 20:453
Gluecktern, P., Potential uses of solar energy for water desalination, 20:653 (IA;IL)
Gnanalingam, K., Electricity demand forecasting techniques, 20:891 (I;LK)

Gobby, P.L., Low density gas and foam targets for ICF long scale length plasma experiments: Fabrication & characterization, 20:2442 (R;US)
Godamanne, G., The relation between ultrasonic properties and the critical temperature in Fe doped BSCCO, 20:1203 (IA;AU)
See Anderson, A.R., 20:1205
See Sujito, 20:1183
Godammanne, G., *See* Sujito, 20:2372
Godfrey, L., Development of a simple beam monitor at FNRF, 20:1634 (IA;TH)
Godfrey, R.D., Atom probe field ion microscopy and related topics: A bibliography 1993, 20:1488 (R;US)
Godoy, A., Report to: 3. steering committee meeting of the extrabudgetary programme on safety of WWER NPPs, 20:763 (RA;XA)
Goeler, S. von, The simulation of hard x-ray images obtained during lower hybrid current drive on PBX-M, 20:2421 (R;US)
Goettlein, A., *See* Kreutzer, K., 20:1811
Goetz, F., *See* Humphries, D., 20:1604
Goheen, S.C., *See* Fadeff, S.K., 20:1334
Gold, M., Data acquisition for the CDF SVX II upgrade, 20:1622 (R;US)
Goldammer, W., Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness, 20:912 (RA;US)
See Nelson, R.A., 20:975
Goldfeld, A., *See* Biryukov, S., 20:648
Goldsmith, R.L., *See* Bishop, B.A., 20:60
Goldstone, J.A., *See* Bourke, M.A.M., 20:1330
Goldzahl, L., *See* Frascaria, R., 20:2252
Golovko, V.F., Flow schemes and design features of HTGR residual heat removal systems, 20:776 (RA;XA)
Goltsev, A.O., *See* Mosevitskij, I.S., 20:782
Gomez, V.M., *See* Gobby, P.L., 20:2442
Gomi, Y., *See* Yamakawa, H., 20:207, 20:1437
Gontar, A., *See* Hoth, C.W,, 20:791
Gonzalez-Garcia, M.C., *See* Eboli, O.J.P., 20:2105
Good, D.E., Fire protection program fiscal year 1995 site support program plan, Hanford Fire Department, 20:535 (R;US)
Goode, J., *See* Tapanes, E., 20:1258, 20:1661
Goodnow, D., *See* Stohl, F.V., 20:52
Gorbar, Eh.V., Dynamical chiral symmetry breaking in scale invariant quantum electrodynamics in sixth dimensions, 20:2094 (R;UA;In Russian)
Gorelov, V., *See* Guzhovskii, B., 20:2267
Gorenflo, D., DKV joint project: reduction of CFC-emissions in air conditioning and refrigeration. Subproject 6: Pool boiling of new refrigerants and their mixtures at single plain and finned tubes. Final report, 20:1473 (R;DE;In German)
Gorenstein, M.I., *See* Kaempfer, B., 20:2238
Goretta, K.C., Reactive nanophase oxide additions to melt-processed high-$T_c$superconductors, 20:1168 (R;US)
Gosling, F.G., The Manhattan Project: Making the atomic bomb, 20:1692 (R;US)
Gosset, J., *See* Rousteau, S., 20:2161
Goudreau, G.L., *See* Christon, M.A., 20:1452
Gouveia, F.J., *See* Harrach, R.J., 20:515
Goy, C., *See* Beingessner, S.P., 20:1584
Grabke, H.J., *See* Wegge, S., 20:1117
Gradev, G.D., *See* Stefanova, I., 20:282
Gradzka, I., Reduced sensitivity to camptothecin of L5178Y sublines is accompanied by diminished DNA damage, 20:1921 (IA;PL)
Grant, C., *See* Max, N., 20:2561
Grant, K., *See* Campbell, J.A., 20:302
Grant, K.E., *See* Campbell, J.A., 20:303
See Grossman, A.S., 20:1770
Graser, M., *See* Lu, Shin-yee, 20:2562
Grassi, R., *See* Ghirardi, G.C., 20:1978
Grassl, H., *See* Krueger, O., 20:1745
Gratadour, J., *See* Fouaidy, M., 20:1554
Grauf, E., German system for training and qualification of NPP-personnel, 20:2474 (RA;XA)
Graves, C.E., Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)
Gray, E.M., *See* Kennedy, S.J., 20:1127
Gray, E.M.A., *See* Blach, T.P., 20:2380
Gray, J.A., *See* Paul, P.H., 20:1424
Gray, P.L., High level waste tank farm solid waste radionuclide smear sample and analysis plan, 20:438 (R;US)
Gray, R.H., New distribution records and notes on the life history and behavior of the sand roller, Percopsis transmontana (Eigenmann and Eigenmann), 20:835 (R;US)
See Haynes, J.M., 20:838
Gray, S., *See* Strayer, W.T., 20:2559
Greager, T.M., Remote automated material handling of radioactive waste containers, 20:333 (R;US)
Solid waste management complex site development plan, 20:364 (R;US)
Grebennikov, A., *See* Guzhovskii, B., 20:2267
Green, D.J., The mechanical behavior of surface-modified ceramics: Final report, June 1, 1990–May 31, 1994, 20:1176 (R;US)
Green, J., *See* Flowers, L., 20:1001
Greenberg, S.E., *See* Sezgen, A.O., 20:1020
Greene, A.F., *See* Wanderer, P., 20:1544
Greene, C.H., Physics of correlated studies: Final report, September 1, 1990–November 30, 1993, 20:2292 (R;US)
Greenway, R.B. Jr., *See* Brooks, S.L., 20:1046
Greimann, L., Buckling evaluation of System 80+™ containment, 20:879 (R;US)
Grenier, M., New regulation of radioactive materials transport, 20:187 (R;FR;In French)
Gresillon, D., *See* Sosenko, P.P., 20:2414, 20:2415
Gretsinger, W.T., Low-level waste vitrification plant environmental permitting plan, 20:405 (R;US)
Griffin, C.J., *See* Kieu, T.D., 20:2027
Griffith, A., *See* Zitomer, M., 20:103
Griffith, B., Optimizing the effective conductivity and cost of gas-filled panel thermal insulations, 20:1026 (R;US)
Grigoryev, E.I., Radiation stability of crown ether - metal ions complexes, 20:1389 (IA;PL)
Grindley, T., *See* Campbell, W.M., 20:6
Grinstead, J.H. Jr., *See* Pugh, K.C., 20:1372
See Salladay, D.G., 20:695
Grodkowski, J., Reactivity of halogenorganic radicals in DMSO solution, 20:1400 (IA;PL)
See Pogocki, D., 20:1397
Gronau, D., Cooperation with CIS in training of NPP-Personnel. (Supported by German Government and European Community), 20:2500 (RA;XA)
Gronauer, A., Factors of influence relevant to ammonium release from liquid manure used as a basis for process-technical improvements, 20:1742 (I;DE;In German)
Gropp, W., *See* Kettunen, L., 20:2524, 20:2525
Grossiord, J.Y., *See* Bedjidian, M., 20:2385
Grossman, A.S., Effects of tropospheric aerosols on radiative flux calculations at UV and visible wavelengths, 20:1770 (R;US)
Grossman, G., Simulation and performance analysis of a quadruple-effect lithium bromide-water absorption, 20:1015 (R;US)
Grossman, J.W., Testing of the SAIC facets on the stretched-membrane dish, 20:706 (R;US)
Grudpan, K., New continuous analysis for radio-release technique, 20:1307 (IA;TH;In Thai)
Some studies on extractive liquid scintillation counting for Th-234/P-234m, 20:1308 (IA;TH;In Thai)
Gruen, D.M., *See* Lin, Yuping, 20:1291
Gruver, J.L., Nonlinearity induced nontrivial dynamics in the Jaynes-Cummings Hamiltonian, 20:1985 (R;XA)
Gu, D., *See* Klavetter, E.A., 20:317
Gu, G., *See* Anderson, A.R., 20:1205
Gu, G.D., Superconductivity of Fe-substituted Bi_2 Sr_2 Ca_1 Cu_2 O_x single crystals, 20:1218 (IA;AU)
See Miles, P.A., 20:2375
See Zhao, Y., 20:1196, 20:1260
Gu, Genda, *See* Godamanne, G., 20:1203
Guan, P., Molecular dynamics simulation of ion impact phenomena in 3 D nickel lattice, 20:2350 (IA;AU)

Guderian, R., Reactions of tree species to air pollutants under controlled conditions, 20:1961 (IA;DE;In German)
Guedda, M., *See* Kirane, M., 20:2011
Guha, S., Research on stable, high-efficiency amorphous silicon multijunction modules: Final subcontract report, 1 January 1991–31 August 1994, 20:685 (R;US)
Guichard, A., *See* Bedjidian, M., 20:2385
Guidotti, R.A., Development of a tester for evaluation of prototype thermal cells and batteries, 20:1674 (R;US)
Gukhman, G.A., *See* Koltun, M.M., 20:663
Gundiler, I.H., Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)
Guo, W., *See* Turinsky, P.J., 20:801
Guo, X., *See* Waddill, G.D., 20:2342
Guo, Y.C., Microstructural and superconducting properties of Bi(2223)/Ag tapes during heat treatment process, 20:1193 (IA;AU)
Gupta, A., *See* Pope, G.A., 20:95
Gurarie, V., Investigation of carbon-nitride depositions produced by high energy density discharge in nitrogen gas atmosphere, 20:1216 (IA;AU)
Gurinovich, G.P., *See* Dzilinski, K., 20:1904
Gurley, L.R., *See* Cobo, J.M., 20:1967
Guthrie, M.D., 242-A Campaign 94-1 post run document, 20:404 (R;US)
Gutowski, W.J. Jr., Hydrologic and radiative feedbacks on extratropical transient eddies: Implications of global warming, 20:1720 (RA;US)
Guttormsen, M., Spin dependent pre-equilibrium formation in the $^{163}Dy(^{3}He,\alpha)$ reaction, 20:2274 (R;NO)
Guzhovskii, B., Nuclear data review and compilation for ATW systems, 20:2267 (R;US)
Guzman, A., *See* Bassett, R.L., 20:1824
Gwo, J.P., Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique, 20:295 (R;US)
Gyoergy, I., *See* Hildenbrand, K., 20:1388

H

Ha Huy Bang, On connection of q-deformed para oscillators with para oscillators, 20:1988 (R;XA)
Haapalehto, T., *See* Bartak, J., 20:761
Haas, J.C., Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 3, Test plan, 20:13 (R;US)
Haas, K.A., *See* Teuchert, E., 20:774
Haas, P.A., *See* Ramey, D.W., 20:293
Haber, S., Presentation of the G-24 technical working group on training, 20:2495 (RA;XA)
Habermann, G., *See* Bett, A., 20:683
Habib, S., Quantum diffusion, 20:2001 (R;US)
Habich, A., *See* Bett, A., 20:683
Hackenberg, G., *See* Cramer, G., 20:1059
Haefner, W., *See* Wolf, L., 20:785
Haeften, B. von, *See* Wio, H.S., 20:2016
Haenninen, S., Experience based reliability centered maintenance: An application on motor operated valve drives, 20:753 (R;FI)
See Simola, K., 20:754
Haffmans, A.F., Confinement and stability of crystalline beams in storage rings, 20:1530 (R;US)
Crystalline beams: The horizontal zigzag: Informal report, 20:1529 (R;US)
Hafich, M.J., *See* Shul, R.J., 20:1287
Haggerty, J.S., *See* Sheldon, B.W., 20:1170, 20:1171
Hagood, M.C., Combining innovative technology demonstrations with dense nonaqueous phase liquids cleanup, 20:1843 (R;US)
Hagrman, D.L., *See* Merrill, B.J., 20:2437
Hagston, W., *See* Usher, B.F., 20:2324
Hague, J.R., Kansas State University, DOE/KEURP site operator program: Year 4 first quarter report, June 1–August 31, 1994, 20:1076 (R;US)
Hahman, W.R., *See* Witcher, J.C., 20:710
Hahne, M., Fatigue and component-tests on SiSiC-tubes, 20:1236 (R;DE;In German)
Hailey, S.M., A comparison of real-time radiography results and visual characterization results with emphasis on WIPP WAC and TRAMPAC compliance issues, 20:255 (R;US)
Hailwood, E.A., *See* Maddock, R.H., 20:1836
Hakansson, P., *See* Boussofiane-Baudin, K., 20:2359
Hake, J.F., The Ikarus project, 20:918 (IA;IL)
Hale, N.S., Work management administration FY 1995 site support program plan WBS 6.2, 20:2523 (R;US)
Hall, E.J., Radiation physics, biophysics, and radiation biology: Progress report, December 1, 1993–November 30, 1994, 20:1912 (R;US)
The Radiological Research Accelerator Facility: Progress report, December 1, 1993–November 30, 1994, 20:1913 (R;US)
Hall, L.E., Structural and electronic properties of C_60H_{36}, 20:1263 (IA;AU)
Hall, N.M.J., Transient and stationary eddies in differing GCM climates, 20:1721 (RA;US)
Hall, R.B., *See* Collins, S.R., 20:684
Haller, E.E., *See* Chen, A.L., 20:1283
See Moll, A.J., 20:1284
Hallett, M.S., *See* Emerson, D.W., 20:145
Halperin, D., Assembly partitioning with a constant number of translations, 20:1447 (R;US)
Halverson, T.G., *See* Slater, G.D., 20:409
Hamacher, T., *See* Albrecht, H., 20:2144, 20:2146
Hamblen, D.G., *See* Solomon, P.R., 20:729
Hamer, C.J., *See* Oitmaa, J., 20:2391
Hamilton, M.L., *See* Schubert, L.E., 20:1162
Hamilton-Smith, T., *See* Rutledge, J.T., 20:122
Hammad, F.H., *See* Abdelazim, M.E., 20:1101, 20:1102
See Gadallah, A.A., 20:795
Hammer, W., *See* Wasek, M., 20:1324
Hamp, S., Economics, funding and the influence of politics on the UMTRA Project, 20:908 (RA;US)
Hanaki, Hirofumi, Upgrade of the RF source for PF linac by pulse compression, 20:1575 (RA;JP;In Japanese)
See Yamaguchi, Seiya, 20:1576
Hanelt, E., *See* Bernas, M., 20:2251
See Czajkowski, S., 20:2246
Haneman, D., *See* Crisp, R.S., 20:2323
See Jafar, M., 20:2353
See Li, D.G., 20:1189
See Sabet-Dariani, R., 20:1271
See Wu, S., 20:1272
Hanford, J.W., *See* Hwang, R.J,, 20:990
Hanlon, B.E., A partial unification model in non-commutative geometry, 20:2099 (R;AU)
Ten dimensional SO(10) G.U.T. models with dynamical symmetry breaking, 20:2066 (R;AU)
Hanlon, J.A., *See* Woloshun, K., 20:1649
Hanold, K.A., Heavy residues from very mass asymmetric heavy ion reactions, 20:2268 (R;US)
Hansen, J.B., *See* Forty, R.W., 20:1618
Hansen, J.D., *See* Forty, R.W., 20:1618
Hansen, P.G., *See* Anne, R., 20:2248
Hansen, T., Transient eddies and low frequency variability in the Northern Hemisphere winter climates of two GCMs, 20:1722 (RA;US)
Hao Bailin, *See* Fang Hai-ping, 20:2015
Harasimowicz, M., Radiotracer investigation of the six-drawing machine glass furnace for flat glass production, 20:594 (IA;PL)
Harder, B.J., *See* Eggington, W.J., 20:120
Harfoush, F., *See* Saewert, G., 20:1535
Harker, S.J., Structural and magnetic properties of Nd $Ni_{8.6-x}$ Fe_x $Si_{2.4}$, 20:1138 (IA;AU)
Harlan, R.A., Performance report for a small package counter that uses active neutron interrogation, 20:559 (R;US)
Harms, S.L., *See* McCarthy, K.A., 20:2434

Haroutunian, R., *See* Bedjidian, M., 20:2385
See Clergeau, J.F., 20:1653
Harrach, R.J., LLNL NESHAPs, 1993 annual report, 20:515 (R;US)
Harris, B.A., Matrix element and complex l-plane evaluation of two-loop vacuum amplitudes in QED on S4, 20:2071 (R;AU)
Harris, J.M., Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)
Harris, T., *See* Stampfer, J.F., 20:1487
Harrison, D.P., Advanced sulfur control concepts in hot-gas desulfurization technology: Quarterly report, April–June 1994, 20:16 (R;US)
Harte, J.A., *See* Ho, D.D.M., 20:2447
Hartfield, S.W., *See* Hester, R.D., 20:627
Hartley, S.A., *See* Remund, K.M., 20:299, 20:300
Hartman, A., Electronic structural changes in Y_{1-x} Pr_x Ba_2 Cu_3 $O_{7-\delta}$ single crystals due to Pr4f states, 20:2395 (IA;AU)
Hartmann, A., *See* Martin, J.W., 20:1217
Hartung, L., Testing of low-emission motorcycles, 20:1084 (I;DE;In German)
Hartung, T., *See* Kowalski, P., 20:2570
Hasegawa, Atsushi, *See* Yamagishi, Shigeru, 20:818
Hasegawa, H., *See* Obata, Y., 20:1930
Hasegawa, K., R and D works of the DTL for the BTA in JAERI, 20:1563 (RA;JP;In Japanese)
Haselow, J.S., *See* Hiergesell, R.A., 20:477
Hasselmann, K., *See* Hegerl, G.C., 20:1755
Hassett, D.J., *See* Benson, S.A., 20:63
Hassinen, P., *See* Okko, O., 20:1841
Hast, C., Test of internal halo targets in the HERA proton ring, 20:1602 (R;DE)
See Albrecht, H., 20:2144, 20:2146
Hatmaker, T.L., *See* Watkins, D.R., 20:224
Hattori, Toshiyuki, *See* Takeda, Osamu, 20:1559
See Wu Guanglu, 20:1536
Hatva, T., *See* Korkka-Niemi, K., 20:1842
Hauer, A., *See* Lindman, E.L., 20:2441
Hauserman, W.B., *See* Benson, S.A., 20:63
Hauth, J.T., Security Transition Program Office (STPO), technology transfer of the STPO process, tools, and techniques, 20:549 (R;US)
Havrilla, G., *See* Quagliano, J.R., 20:1503
Hawryluk, R.J., Review of recent D-T experiments from TFTR, 20:2443 (R;US)
Haxton, W.C., Constraints on T-odd and P-even hadronic interactions from nucleon, nuclear, and atomic electric dipole moments, 20:2080 (R;US)
Hayashi, Kazutaka, Multipactors in klystron cavities, 20:1568 (RA;JP;In Japanese)
Hayashi, Toru, Detection of irradiation treatment of foods, 20:1898 (IA;JP;In Japanese)
Hayashi, Yuzo, *See* Seyama, Toshio, 20:1932
Hayes, A.B., Operator's manual for the multistation offgas analysis system, 20:1489 (R;US)
Haynes, J.M., Diel and seasonal white sturgeon (Acipenser transmontanus) movements in relation to Columbia River temperatures, 20:838 (R;US)
Haynes, W.M., Thermophysical properties of HFC-143a and HFC-152a: Final report, April 1, 1993–June 30, 1994, 20:1243 (R;US)
He Shuyan, *See* Gao Zuying, 20:775
He, Jianliang, *See* Rote, D.M., 20:1080, 20:1081
He, Xiaogang, Anomalous WWZ couplings and $K_L \rightarrow \mu^+ \mu^-$, 20:2184 (R;AU)
He, Y.Y., *See* Zhao, Y., 20:1195
Heasler, P.G., *See* Remund, K.M., 20:299, 20:300
Heber, U., The response of leaves to potentially acidic gases, 20:1963 (IA;DE)
See Pfanz, H., 20:1965
Hebner, G., *See* Bodette, D.E., 20:1506
Heckman, S., *See* Adewumi, M.A., 20:128
Heek, A. van, *See* Teuchert, E., 20:774
Heenen, P.H., *See* Gall, B., 20:2215
Hegerl, G.C., Detecting anthropogenic climate change with an optimal fingerprint method, 20:1755 (R;DE)
Hehl, F.W., *See* Ne'eman, Y., 20:2033
Heikkinen, D.W., *See* Roberts, M.L., 20:1336
Heil, T., *See* Kley, D., 20:1756
Heindel, G., *See* Clow, J., 20:502
Heineman, R.E., The role of exponential and PCTR experiments at Hanford in the design of large power reactors, 20:859 (R;US)
Heinrich, M., Release of propane under practice-oriented conditions - calculation of concentrations of gases with and without obstacles, 20:901 (R;DE;In German)
Heinz, A., *See* Bernas, M., 20:2251
Helble, J.J., *See* Pigeaud, A.E., 20:64
Helene, O., Cs^{137} soil-to-plant transfer factor, 20:1799 (I;BR)
Helland, G., *See* Martinez, V.A., 20:286
Heller, W., *See* Sandermann, H. Jr., 20:1964
Hemmen, J.E., *See* Salladay, D.G., 20:695
Hempfling, R., Detecting the non-minimal supersymmetric Higgs boson at the NLC, 20:2187 (RA;DE)
Radiative corrections to the supersymmetric Higgs sector, 20:2107 (RA;DE)
Hemzal, K., Generalized assessment of heat-storage accumulators based on energy profiles, 20:1037 (R;US)
Henalsh, B.A., Some aspects on neutron dosimetry, 20:1615 (R;EG)
See Yossef, S.K., 20:1480
See Youssef, S.K., 20:1907
Hendricks, K.J., *See* Coleman, P.D., 20:1509
Hendrucko, B., *See* Tonn, B., 20:1826
Henley, E.M., *See* Chan, C.T., 20:2081
Henning, P.A., Fermion damping rate in a hot medium, 20:2207 (R;DE)
Hennino, Th., Exclusive measurements of Δ excitation by the (^{3}He,t) reaction, 20:2249 (R;FR)
Henson, T.D., Lidar technologies for airborne and space-based applications, 20:1666 (R;US)
Hepworth, M.T., Hot coal gas desulfurization with manganese-based sorbents: Quarterly report, January–March 1994, 20:15 (R;US)
Herault, L., *See* Derou, D., 20:1462
Herczeg, A.L., *See* Edis, R., 20:1802
Herman, F., *See* Damle, A.S., 20:17
Herrmann, M., Source dimensions in ultrarelativistic heavy ion collisions, 20:2235 (R;US)
Hertel, E.S. Jr., A comparison of phase change phenomena in CTH with experimental data, 20:1682 (R;US)
See Mullin, S.A., 20:1698
Hertel, G., Forest damage research programme. Research on atmospheric pollutant deposition in American forests, 20:1818 (IA;DE;In German)
Herting, D.L., Significant volume reduction of tank waste by selective crystallization: 1994 Annual report, 20:416 (R;US)
Heseltine, T., *See* Bowden, G.J., 20:2284
Hesketh, R.P., *See* Pendergrass, R.A. II, 20:1423
Hesse, M., *See* Bernas, M., 20:2251
Hessel Andersen, N., Relations between structural and superconducting properties of bulk and thin film high-T_c materials, 20:2386 (R;DK)
Hester, R.D., A process for separating acid-sugar mixtures using ion exclusion chromatography, 20:627 (R;US)
Hettel, R., *See* Corbett, J., 20:1608
Heung, L.K., Dimensionally stable metallic hydride composition, 20:615 (PA;US)
Hewett, T.A., *See* Fayers, F.J., 20:113
Hey, B.E., *See* Wootan, D.W., 20:397
Hicken, E., Trends in safety criteria for future reactor plants, 20:745 (RA;XA)
Hickox, C.E., *See* Finger, J.T., 20:712
Hicks, H.R., *See* Oliver, C.E., 20:1427
Hicks, L.D., *See* Farmer, J.C., 20:1004
Hicks, T.J., *See* Ersez, T., 20:1123
See Etheridge, G.T., 20:1270
See Wildes, A.R., 20:1265
Hiergesell, R.A., Hydrologic budget for A/M Area, Savannah River Site, 20:477 (R;US)
Hietala, V.M., *See* Vawter, G.A., 20:1668
Higgins, J.C., *See* Brown, W.S., 20:831
See O'Hara, J.M., 20:830

Hightower, J.O., *See* Martin, H.L., 20:613
Higo, T., *See* Odagiri, J., 20:1570
Higuchi, Hiroshi, *See* Balligand, H., 20:1680
Hiisvirta, L., *See* Korkka-Niemi, K., 20:1842
Hildebrand, E.E., Soil acidification: its extent, development during the last decades, and causes, 20:1820 (IA;DE;In German)
Hildemann, L., *See* Yu, Liya, 20:55
Hildenbrand, K., ESR and pulse radiolysis on the free-radical-induced oxidation of phloroglucinol in aqueous solution, 20:1388 (IA;PL)
Hildner, M.L., *See* Antolak, A.J., 20:2341
Hill, A., *See* Tapanes, E., 20:1258
Hill, D.D., *See* Schake, A.R., 20:503
Hiller, D.B., *See* De Lorenzo, D.S., 20:418
Hilsenbeck, S., *See* Ellis, T.W., 20:1143
Hindi, H., *See* Fox, J.D., 20:1612
Hines, D.F., *See* Bardos, D.C., 20:2428
Hingerty, B.E., Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures, 20:1948 (R;US)
Hinkle, A.L., *See* Lamberd, D.L., 20:360
Hinkle, A.W., Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1, 20:353 (R;US)
Hinman, C.A., Gamma irradiation test report of simulated grout specimens for gas generation/liquid advection, 20:410 (R;US)
See Beaver, T.R., 20:346
Hinterberger, F., *See* Frascaria, R., 20:2252
Hinton, F.L., Theory of the L-H transition, 20:2408 (R;US)
Hinton, M.M., The potential of PCB photochemistry at Moccasin Bend, 20:1777 (R;US)
Hirabayashi, Yoko, *See* Inoue, Tohru, 20:1929
Hirano, K., High power test of L-band RF window using resonant ring, 20:1578 (RA;JP;In Japanese)
Hirokawa, K., Cell interaction in the thymic microenvironment, 20:1936 (RA;JP;In Japanese)
Hirschmugl, C.J., Signal to noise improvements with a new Far-IR rapid-scan Michelson Interferometer, 20:1663 (R;US)
Hirschon, A.S., Novel catalysts for methane activation: Quarterly report No. 3, April 1, 1993–June 30, 1993, 20:631 (R;US)
Novel catalysts for methane activation: Quarterly report No. 7, April 1, 1994–June 30, 1994, 20:632 (R;US)
Hirst, E., *See* Tonn, B., 20:994
Hirvonen, J.P., *See* Jervis, T.R., 20:1158
Hishida, M., *See* Shiina, Y., 20:783
Hitch, J.P., Waste management regulatory compliance issues related to D&D activities at Oak Ridge National Laboratory (ORNL), 20:225 (R;US)
Hjorth-Jensen, M., *See* Engvik, L., 20:2223
Hliniak, A., The application of nuclear technology in cancer radiotherapy, 20:1885 (IA;PL)
Ho, D.D.M., Radiation-driven targets for heavy-ion fusion, 20:2447 (R;US)
Hoang, A.H., Radiative corrections to $e^+e^- \rightarrow \mu^+\mu^-$ and the top decay $t \rightarrow bW$ in the Two Higgs doublet model, 20:2108 (RA;DE)
Hochstein, J.I., *See* Rider, W.J., 20:1476
Hockey, R.L., *See* Richterich, L.R., 20:1496
Hodara, I., *See* Epstein, MM., 20:652
Hodgson, J., *See* Neubauer, M., 20:1614
Hoeck, H., Workshop on climate database systems, 20:2567 (R;DE)
Hoefken, K.D., Rates of wet, moist and dry deposition in forests: measuring approaches and measuring results, 20:1758 (IA;DE;In German)
Hoehn, E., *See* Eikenberg, J., 20:1832
Hoering, A., *See* Haxton, W.C., 20:2080
Hoffman, A., *See* Prawer, S., 20:2360
Hoffman, E.L., Environmental survey at Lucas Heights Research Laboratories, 1992, 20:1703 (R;AU)
Hoffman, J.D., *See* Dennis, R.A., 20:18
Hoffmann, E., Preparation and conduct of simulator training in Germany, 20:2476 (RA;XA)
The German center for the simulator training of nuclear power plant personnel, 20:2475 (RA;XA)
Hoffmann, E.L., Environmental survey at Lucas Heights Research Laboratories, 1991, 20:1702 (R;AU)
Hoffmann, S.K., Electron spin-echo studies of spin-spin relaxation processes, 20:1353 (IA;PL)
Hoffmann, V., *See* Baurichter, F., 20:917
Hofman, G.L., *See* Wiencek, T.C., 20:839
Hofmann, P., Chemical interactions between as-received and pre-oxidized Zircaloy-4 and Inconel-718 at high temperatures, 20:1150 (R;DE)
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and stainless steel at high temperatures, 20:1151 (R;DE)
Hofmann, R.P., *See* Albrecht, H., 20:2144, 20:2146
Hofmann, W., *See* Hast, C., 20:1602
Hogan, R.E., *See* Gartling, D.K., 20:1477
Hogg, J.C.H., *See* Usher, B.F., 20:2324
Hohlfeld, K., *See* Alberts, W.G., 20:1942
Holcomb, D.J., Geomechanics of horizontally-drilled, stress-sensitive, naturally-fractured reservoirs, 20:123 (R;US)
Holder, D.A., AES6.0F: Automated Estimating System, 20:2537 (CM;US)
Holdren, G.R., *See* Short, S.M., 20:511
Holland, J.F., Test interference calculations for the Yucca Mountain Project ESF thermomechanical experiments: Yucca Mountain Site Characterization Project, 20:314 (R;US)
Hollander, M.G., *See* Yu, N., 20:1237
Hollenberg, L.C.L., Staggered magnetization in the Heisenberg antiferromagnet, 20:2074 (R;AU)
The Hamiltonian of SU(2) lattice gauge theory in approximate tridiagonal form, 20:2073 (R;AU)
Hollenstein, C., *See* Courteille, C., 20:2418
Holleris Petersen, E., *See* Rasch, L., 20:1017
Hollik, W., *See* Dabelstein, A., 20:2186
Holt, M.T., *See* Breed, C.E., 20:1704
Holzapfel, B., Effect of columnar defects on the critical current anisotropy of epitaxial $YBa_2Cu_3O_{7-\delta}$ thin films and $YBa_2Cu_3O_{7-\delta}/PrBa_2Cu_3O_{7-\delta}$ multilayers, 20:1207 (IA;AU)
Holzapfel, C., *See* Kley, D., 20:1756
Honey, M., *See* Oliver, C.E., 20:1427
Honma, Hiroyuki, Upgrade of the PF linac klystron modulator for the KEK B-factory project, 20:1572 (RA;JP;In Japanese)
See Michizono, Shinichiro, 20:1567
Honstead, J.F., *See* Foster, R.F., 20:834
Hoole, D.T., Solid oxide fuel cells in the United States, 20:1012 (R;US)
Hooper, E.B., MTX final report, 20:2427 (R;US)
Hoopes, V., *See* Campbell, J.A., 20:302
Hopkins, D.J., LLNL/Lion Precision LVDT amplifier, 20:1511 (R;US)
Horgos, R.M., *See* Lamberd, D.L., 20:360
Hornik, K.E., *See* Shutt, R.P., 20:1542
Hornshoj, P., *See* Anne, R., 20:2248
Hoskins, B.J., *See* Ambrizzi, T., 20:1713
Hotchandani, S., *See* Kamat, P.V., 20:1373
Hoth, C.W., Characteristics of prototype TOPAZ-II fuel, 20:791 (R;US)
Houlberg, L.M., *See* Etnier, E.L., 20:500
Hourani, E., *See* Vernotte, J., 20:2250
Houser, R.M., *See* Grossman, J.W., 20:706
Howard, A.J., Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs, 20:1507 (R;US)
See Baca, A.G., 20:1505, 20:2307
Howard, J.B., Aromatics oxidation and soot formation in flames: Progress report, August 15, 1993–June 30, 1994, 20:1420 (R;US)
Howling, A.A., *See* Courteille, C., 20:2418
Hoyer, E., Advanced Light Source elliptical wiggler, 20:1605 (R;US)
ALS Multiple Trim Magnets, or "Magic Fingers," for insertion device field integral correction, 20:1591 (R;US)
Undulators at the ALS, 20:1590 (R;US)
Hoyes, G., *See* Godfrey, L., 20:1634
Hsi, W.C., *See* Kunde, G.J., 20:2239
Hsing, W.W., *See* Gobby, P.L., 20:2442
Hsu, Chia-Wei, Photodissociation and photoionization of organosulfur radicals, 20:2294 (R;US)
Hu, Boping, *See* Li, Hongshuo, 20:1131
Hu, J., *See* Goretta, K.C., 20:1168
Hu, Q.Y., *See* Dou, S.X., 20:1120
Hua, T.Q., *See* Evtushenko, I.A., 20:2429
Huang, B., *See* Kurn, D.M., 20:992

Huang, S.N., *See* Chen, W.W., 20:1453
Huang, Y.J., *See* Sezgen, A.O., 20:991
Huber, W., Life cycle analysis of photovoltaic-supplied solar filling stations for electric passenger vehicles, 20:654 (IA;IL)
Hubert, P., National arrangement to handle nuclear emergencies, 20:2578 (IA;PL)
Hudak, P., Research in functional programming on multiprocessor architectures: Final report, 20:2535 (R;US)
Huesties, L.R., *See* Short, S.M., 20:511
Huffman, G.P., *See* Stohl, F.V., 20:52
Huggins, F., *See* Stohl, F.V., 20:52
Hughes, K.R., The United States Department of Energy Office of Industrial Technology's Technology Benefits Recording System, 20:931 (R;US)
Hulet, E.K., *See* Schaedel, M., 20:2241
Hull, D.G., Missile sizing for ascent-phase intercept, 20:1699 (R;US)
Hull, T.E., Bar-code automated waste tracking system, 20:556 (R;US)
Hult, M., *See* Walker, S.R., 20:2330
Humbert, F., *See* Anne, R., 20:2248
Hummer, G., Potential-of-mean-force description of ionic interactions and structural hydration in biomolecular systems, 20:1868 (R;US)
Humphries, D., A multiple objective magnet sorting algorithm for the ALS insertion devices, 20:1604 (R;US)
See Hoyer, E., 20:1605
Hunacek, G.S., KE Basin water dispositioning engineering study, 20:470 (R;US)
Hungate, F.P., Cooperative study of clinical benefits from use of the fully portable blood irradiator, 20:932 (R;US)
Hunt, R.D., *See* Mullin, S.A., 20:1698
Hunter, R.B., Status of the flora and fauna on the Nevada Test Site, 1993: Results of continuing basic environmental monitoring, January through December 1993, 20:1789 (R;US)
Hussain, F., Heavy quark effective theory, interpolating fields and Bethe-Salpeter amplitudes, 20:2084 (R;XA)
Hussonnois, M., *See* Rotbard, G., 20:2244
Hutchings, L., *See* Zucca, J.J., 20:713
Hutchinson, W.B., *See* Paffett, M.T., 20:1763
Hutchinson, W.D., Transient NMRON - recent advances, 20:2319 (IA;AU)
Hwang, Ho-Ling, *See* Tonn, B., 20:1826
Hwang, R.J., Residential appliance data, assumptions and methodology for end-use forecasting with EPRI-REEPS 2.1, 20:990 (R;US)
Hyde, R.A., Buried waste integrated demonstration FY 94 deployment plan, 20:498 (R;US)
See Owens, K.J., 20:266
Hyodo, Kazuyuki, *See* Ando, Masami, 20:1878
Hyre, R.A., *See* LeClair, M.D., 20:361

I

Ibraeva, E.T., *See* Peresypkin, V.V., 20:2230
Ibrahim, M.K., *See* Mohammed, F.A., 20:821
Ichikawa, S., *See* Takami, A., 20:1086
Ignat, D., *See* Goeler, S. von, 20:2421
Ignatiev, A. Yu., Can the electric charges of elementary particles change with time?, 20:2200 (R;AU)
Igo-Kemenes, P., Measurements in the $e^+e^- \rightarrow t$ anti t threshold region, 20:2128 (RA;DE)
Igou, R.E., *See* Walker, E.W. Jr., 20:1461
Iguchi, Tatsuro, *See* Yamada, Masafumi, 20:948
Iida, T., *See* Tsuda, K., 20:1249
Ikeda, Kazumi, Cold model test of a DTL with transition from 4π to 2π-mode acceleration, 20:1538 (RA;JP;In Japanese)
Ikeda, Yujiro, *See* Maekawa, Fujio, 20:2439
Ikegami, Masanori, *See* Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Il'in, I.V., *See* Amirkhanov, I.V., 20:2545
Il'in, V., *See* Guzhovskii, B., 20:2267
Il'in, V.D., *See* Amirkhanov, I.V., 20:2545
Il'ina, A.N., *See* Amirkhanov, I.V., 20:2545
Ilaiwi, K.F., Photoionization of shallow donor impurities in finite-barrier quantum wells, 20:2283 (R;XA)
Ilakovac, A., CP violation in Higgs decays due to Majorana neutrinos, 20:2103 (RA;DE)
Iles-Brechak, K.D., *See* Oliver, C.E., 20:1427
Iller, E., *See* Chmielewski, A.G., 20:599
See Zimek, Z., 20:601
Ilyin, V.A., *See* Boos, E.E., 20:2142
Inaba, S., *See* Donskov, S.V., 20:1585
Inagaki, Y., *See* Takada, S., 20:786
Ingemansson, T., Methods for estimating the content of transuranium and other difficult to measure nuclides in produced rad waste from BWRs, 20:215 (R;SE)
Ingerslev, C., *See* Morthorst, P.E., 20:995
Ingestad, T., Modelling nutrition and growth in pollution research, 20:1966 (IA;DE)
Inkret, W., *See* Clow, J., 20:502
Inoue, Makoto, *See* Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Inoue, Tohru, Effect of radiation on transgenic mice carrying a variety of oncogenes, 20:1929 (RA;JP;In Japanese)
See Yoshida, Kazuko, 20:1940
Ioannou, P.J., Stochastic excitation of low frequency variability in the midlatitude atmosphere, 20:1723 (RA;US)
Iofa, M.Z., *See* Belokurov, V.V., 20:2049
Ionescu, H.M., Oxygen annealing of Bi_2 Sr_2 Ca_1 Cu_2 O_{8+x} single crystals, 20:1204 (IA;AU)
Ionescu, M., *See* Dou, S.X., 20:1120
See Ramer, R., 20:1209
Isaksen, I.S.A., *See* Wei-Chyung, Wang, 20:1709
Isermann, R., *See* Pfannstiel, D., 20:1014
Ishibashi, K., Neutron measurement for the reactions induced by high-energy protons, 20:2255 (RA;JP)
Ishiekwene, G.C., Construction of a nitrogen laser for plasma diagnostics, 20:2412 (R;XA)
Evolution of Spark plasma using nitrogen laser shadowgraphy system, 20:2410 (R;XA)
Ishihara, M., *See* Rehm, W., 20:779
Ishii, M., Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)
Iskander, S.K., *See* Keeney, J.A., 20:810
See McCabe, D.E., 20:1161
Iske, U., Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report, 20:1362 (I;DE;In German)
Ismail, B., A safeguards approach applicable to A plutonium mixed oxide powder plant, 20:162 (R;EG)
Isobe, H., Alligator Rivers Analogue project. Weathering and its effects on uranium redistribution: Final Report - Volume 9, 20:1803 (I;AU)
Ito, C., *See* Saegusa, T., 20:199
Ito, Takashi, Gene rearrangement and radiation carcinogenesis: BCR/ABL and RET oncogene, 20:1931 (RA;JP;In Japanese)
See Seyama, Toshio, 20:1932
Iwasaki, Masako, Measurement of inclusive electron cross section in $\gamma\gamma$ collisions, 20:2169 (RA;JP)
Iwashita, Yoshihisa, Tunable frequency 4-rod RFQ, 20:1557 (RA;JP;In Japanese)
See Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Iyeki, Hiroshi, *See* Hayashi, Kazutaka, 20:1568
Iyengar, S.S., *See* Rao, N.S.V., 20:2554
Iyer, N.C., *See* Louthan, M.R. Jr., 20:211

J

Jaaatinen, E., *See* Hutchinson, W.D., 20:2319
Jacco, J.C., *See* Quagliano, J.R., 20:1503
Jackson, D.G., *See* Hiergesell, R.A., 20:477
Jackson, D.J.C., Theory of freezing of a flux lattice in high T_c superconductors, 20:2370 (IA;AU)
Jacobsen, H., *See* Morthorst, P.E., 20:995
Jacobsen, P.H., *See* Hinkle, A.W., 20:353
Jacobson, F.D., *See* Finger, J.T., 20:712

Jaeger, E., *See* Schaedel, M., 20:1299, 20:2241
Jaeger, G.K., *See* Lindsey, K.A., 20:340
Jaeger, H.J., State of the discussion on standard values for atmospheric pollutant concentrations, 20:1819 (IA;DE;In German)
Jafar, M., Memory switching and quantum effects in amorphous hydrogenated silicon, 20:2353 (IA;AU)
Jahn, R., *See* Frascaria, R., 20:2252
Jahn, W., *See* Rehm, W., 20:779
Jakovidis, G., *See* Jinks, D., 20:2337
Jalabert, R.A., *See* Ullmo, D., 20:2024
Jambrich, I., Description of training activities and re-training system for nuclear professionals at the Paks Nuclear Power Plant, Hungary, 20:2502 (RA;XA)
Jamelson, D.N., *See* Allen, M.G., 20:1289
James, B.D., *See* Jiang, Z.T., 20:1266
James, B.W., *See* Khachan, J., 20:1253
James, G., Damage detection and health monitoring of operational structures, 20:1445 (R;US)
Jamieson, D.N., Cross sectional imaging of single crystal materials by ion beam analysis, 20:2349 (IA;AU)
See Dooley, S.P., 20:2355
See Witham, L.C., 20:2328
Jamison, M.E., High level waste characterization in support of low level waste certification: I. HLW supernate radionuclide characterization, 20:435 (R;US)
Janas, Z., Beta decay of the new isotope ^{101}Sn, 20:2226 (R;DE)
Jangland, L., Measurement of radiation dose with a PC-based instrument, 20:1944 (R;SE;In Swedish)
Jannik, G.T., Savannah River Site Environmental Monitoring Plan: Volume 1, Section 1000 Addendum: Revision 3, 20:473 (R;US)
Janot, P., Higgs boson search at a 500 GeV e^+e^- collider, 20:2176 (R;FR)
Jantzen, C.M., Method for treating materials for solidification, 20:296 (PA;US)
Jaquish, W.R., PUREX irradiated fuel recovery simulation, 20:186 (R;US)
Jaramillo, G.R., *See* Smith, D.B., 20:557
Jarboe, T., [Coaxial Slow Source]: [Annual report, November 16, 1990–November 15, 1991], 20:2404 (R;US)
Jaroszewski, M., *See* Wilgocki, M., 20:1356
Jaske, R.T., *See* Foster, R.F., 20:834
Jechorek, M., *See* Iske, U., 20:1362
Jekel, R.A., Special initiatives FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 5.0, 20:938 (R;US)
Jellison, J.L., Laser materials processing at Sandia National Laboratories, 20:1164 (R;US)
Jenkins, B., YBCO thin film deposition by cathodic arc and laser ablation, 20:1185 (IA;AU)
Jennings, P., Development and testing of a high efficiency advanced coal combustor: Phase III Industrial boiler retrofit: Quarterly technical progress report number 10, January 1–March 31, 1994, 20:88 (R;US)
Jensen, B.A., *See* Liekhus, K.J., 20:256
Jensen, L., *See* Cromar, R.D., 20:417
See Valenzuela, B.D., 20:396
Jensen, R.D., Enhanced sludge washing evaluation plan, 20:328 (R;US)
Jervis, T.R., Tribology and surface mechanical properties of excimer laser nitrided titanium, 20:1158 (R;US)
Jesus, M. De, Nuclear moments of transitional nuclei in the vicinity of Z=40 and Z=82 shells, 20:2222 (R;FR;In French)
Jette, S.J., *See* Sula, M.J., 20:298
Jewsbury, P., *See* Maddison, D.S., 20:1211
Jezabek, M., Comment on the average momentum of top quarks in the threshold region, 20:2076 (RA;DE)
Energy of W distribution in top quark decays, 20:2121 (RA;DE)
Higgs effects in top production, 20:2126 (RA;DE)
Production and decay of t anti t pairs in the threshold region, 20:2127 (RA;DE)
The top width: Theoretical update, 20:2120 (RA;DE)
Jezierski, A., *See* Chmielewski, P.J., 20:1352
Jiang, Z.T., Investigation of ferro electricity in $(CH_3\ NH_3)HgCl_3$, 20:1266 (IA;AU)
Jikia, G., Pair neutral gauge boson production and Higgs signal in γ-γcollisions: $\gamma\gamma\rightarrow\gamma\gamma$, $\gamma\gamma\rightarrow$ ZZ, $\gamma\gamma\rightarrow$ HH, 20:2141 (RA;DE)
Jin, F., *See* Strong, C., 20:1735
Jinks, D., ^{197}Au Moessbauer analysis of gold-doped YBCO, 20:2337 (IA;AU)
Jody, B.J., *See* Brockmeier, N.F., 20:734
Joergensen, K., Alternative propellants and sustainable development: Pilot-project-report, 20:1095 (R;DK;In Danish)
Joergensen, O.B., Solar energy in building renovation: Working documents - Denmark. Feasibility study phase. National participation plan. Solar renovation potential. Case studies. Introduction to solar walls, 20:697 (R;DK)
John, C.J., *See* Eggington, W.J., 20:120
Johnson, A.D., *See* Usher, B.F., 20:2324
Johnson, A.R., Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site, 20:469 (R;US)
Johnson, C.A., *See* Foley, R.D., 20:504, 20:505
Johnson, C.S., Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994, 20:189 (R;US)
See Sonnier, C.S., 20:560, 20:561
Johnson, D.R., *See* Schulz, R.B., 20:1173
Johnson, D.W., Case studies and general patterns of ion budgets in North American forests, 20:1816 (IA;DE)
Johnson, E.D., *See* Brevick, C.H., 20:387, 20:392, 20:393
Johnson, F.X., *See* Hwang, R.J., 20:990
Johnson, G.D., A summary description of the flammable gas tank safety program, 20:411 (R;US)
Johnson, J., *See* Pendleton, R., 20:1613
Johnson, J.R., *See* Adzic, G.D., 20:895
Johnson, K.F., *See* Yuan, V.W., 20:1588
Johnson, K.W., *See* De Lorenzo, D.S., 20:418
Johnson, L.R., *See* Rote, D.M., 20:1080
Johnson, M.E., Tank Waste Remediation System decisions and risk assessment, 20:325 (R;US)
Johnson, P.D., Photoemission and ferromagnetism, 20:2310 (R;US)
Johnson, R.G., Implementation of Beam-Loss Monitor systems for the SSC, 20:1597 (R;US)
Johnson, R.S., *See* Watson, D.J., 20:522
Johnson, S.A., *See* Carson, R.D., 20:14
Johnson, W.C., The effect of elastic stress on Ostwald Ripening Phenomena: Final report, August 1, 1990–July 31, 1993, 20:1108 (R;US)
Johnson, W.H., *See* Serkiz, S.M., 20:271
Johnson, W.L., *See* Frain, J.M., 20:520
Johnston, D.C., *See* Wang, X.L., 20:1174
Johnston, P.N., *See* Studd, W.B., 20:1313
See Walker, S.R., 20:2330
Joly, C., OSIRIS: the first M.T.R. with a new instrumentation and control system based on digital logic of vote, 20:823 (R;FR)
Jones, J., Zeeman shifts and splittings of hydride vibrational lines in rare-earth doped calcium fluoride, 20:2293 (IA;AU)
Jones, K.M., Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)
Jones, L.L., *See* Ellis, T.W., 20:1144
Jones, R., *See* LaMontagne, J., 20:1013
Jones, S.E., *See* Maudlin, P.J., 20:1154
Jones, S.K., *See* Rutledge, J.T., 20:122
Jonson, B., *See* Anne, R., 20:2248
Joon Ha Jin, *See* Wiblin, W., 20:583
Joosten, R., *See* Frascaria, R., 20:2252
Jordan, J., *See* Evans, C.S., 20:474, 20:542
Joshi, G.C., *See* Hanlon, B.E., 20:2066, 20:2099
See Harris, B.A., 20:2071
See Ignatiev, A. Yu., 20:2200
Josten, N.E., Test plan for FY-94 digface characterization field experiments, 20:270 (R;US)
Jou, Jiing-Yih J., Airborne Multisensor Pod System (AMPS) data access concept, 20:970 (R;US)
Jubin, R.T., *See* Ramey, D.W., 20:293
Judkins, R.R., Ceramic fiber ceramic matrix filter development, 20:1492 (R;US)
Juenger, C., *See* Jezabek, M., 20:2121

Juergens, U., Photovoltaic power plant for the partial supply of the new training center of the Hamburgische Electricitaets-Werke AG: Final report, 20:693 (I;DE;In German)
Juilliard, M., *See* Fouaidy, M., 20:1554
Julyk, L.J., 241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:369 (R;US)
241-AV/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:371 (R;US)
Jung, M., First measurements of the beta decay into bound states of the electron: $^{163}_{66}Dy^{66+} \rightarrow ^{163}_{67}Ho^{66+} +$ anti ν_e, 20:2225 (R;DE;In German)
Jungersen, G., Control and regulation of biomass conversion plants: Adaptive regulation of biogas reactors according to total concentration of volatile fatty acids. Control models and implementation, 20:625 (I;DK;In Danish)
Junquera, T., *See* Fouaidy, M., 20:1554
Jurgens, T., *See* Saewert, G., 20:1535
Jury, J.W., *See* Zubanov, D., 20:2275

K

Kabachenko, A.P., *See* Andreev, A.N., 20:2265
Kabeya, Z., *See* Hasegawa, K., 20:1563
Kaczmarek, W.A., *See* Campbell, S.J., 20:2318
See Chambell, S.J., 20:1178
See Onyszkiewicz, I., 20:1180
See Puclin, T., 20:1214
Kadiri, A., On exotic supersymmetries of the $\phi_{1,3}$ deformation of minimal models, 20:2052 (R;XA)
Kaempfer, B., Rapidity dependence of thermal dileptons resulting from hadronizing quark-gluon matter with finite baryon charge, 20:2238 (R;DE)
See Peshier, A., 20:2082
Kaewpila, S., *See* Thongphasuk, J., 20:1899
Kageyama, T., Development of annular coupled structure, 20:1564 (RA;JP;In Japanese)
Kain, C., *See* Martinez, V.A., 20:286
Kaiser, H., *See* Allman, B.E., 20:2004
Kaiser, K., Investigation of different rotor blade forms of wind power plants by means of quasi-steady wind tunnel tests, 20:722 (R;DE;In German)
Kajornrith, V., *See* Dharmavanij, W., 20:610, 20:611
Kakigi, Shigeru, *See* Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Kalafatis, D., *See* Cottingham, W.N., 20:2020
Kalagnanam, J.R., Development of the integrated environmental control model: Performance and cost models for electrostatic precipitators: Quarterly progress report, 20:737 (R;US)
Kale, R., *See* Reimus, P.W., 20:288
Kalifa, J., *See* Vernotte, J., 20:2245, 20:2250
Kalinovskaya, L., *See* Akhundov, A., 20:2158
Kalis, P.O., *See* Hartung, L., 20:1084
Kalisch, G., Production and study of pulsed heavy-ion beams of highest phase-space density in the GSI experimental storage ring, 20:1603 (R;DE;In German)
Kalish, R., *See* Allen, M.G., 20:1289
See Prawer, S., 20:2360
Kallies, W., Ellipsoidal basis for isotropic oscillator, 20:2000 (R;XJ)
Kalyani, N.M.V., *See* Devendra, R., 20:586
Kamat, P.V., Photoinduced charge transfer between fullerenes and TiO_2 semiconductor colloids, 20:1373 (R;US)
Kaminski, R., Relativistic effects in the scalar meson dynamics, 20:2163 (R;FR)
Kan, Taro, *See* Ikeda, Kazumi, 20:1538
Kananov, S., *See* Akhundov, A.A., 20:2160
Kaneff, S., Benefits of deploying solar systems at large scale and to provide energy in various forms, 20:656 (IA;IL)
Paraboloidal-dish solar power system: Comparative and economicaspects, 20:655 (IA;IL)
Kannari, F., *See* Pogorelsky, I.V., 20:1516
Kanne, W.R. Jr., Analysis of welds on helium-containing restraint test plates, 20:813 (R;US)
Kao, Y.H., X-ray studies of microstructures in semiconductor and superconducting materials: Progress report, 20:1245 (R;US)
Kaochoung, P., Sensory evaluation of irradiated and non-irradiated mungbean during storage, 20:1902 (IA;TH;In Thai)
Kapitza, H., *See* Albrecht, H., 20:2144, 20:2146
Kapner, M., Residential photovoltaic hybrid power system, 20:657 (IA;IL)
Karamian, S.A., *See* Rotbard, G., 20:2244
Karasik, A.Ya., *See* Reeves, R.J., 20:2332
Karczewski, G., *See* Chen, A.L., 20:1283
Karlen, J.P., *See* Walker, E.W. Jr., 20:1461
Karni, J., *See* Kribus, A., 20:664
Karoui, S., Study of integrated circuits in natural space environment, 20:1659 (R;FR;In French)
Karpenko, A., Conception to create the system for psychophysiological maintenance of operators' labor in power plants, 20:2484 (RA;XA)
Kartal, S., The use of empirical models to investigate GPS derived total electron content, 20:2014 (R;XA)
Kasai, K., *See* Obata, Y., 20:1930
Kasai, M., *See* Hirokawa, K., 20:1936
Kasameyer, P., *See* Zucca, J.J., 20:713
Kashiwa, B.A., *See* Padial, N.T., 20:1475
Kashiwagi, Atsushi, *See* Satoh, Kazuyuki, 20:1582
Kassem, K.M.A., Determination of mass transfer coefficient in two-phase bubby flow using laser-doppler anemometry, 20:1474 (IA;GH)
Kasten, P.R., *See* Teuchert, E., 20:774
Kastroll, H.J., Information on electricity utilisation in animal breeding farms in the new Laender, 20:1044 (I;DE;In German)
Kato, O., *See* Saegusa, T., 20:199
See Yamakawa, H., 20:1437
Kato, Takao, Design of a beam transport line between the RFQ and the DTL for the 1-GeV proton linac, 20:1562 (RA;JP;In Japanese)
See Yoshino, Kazuo, 20:1561
Katsaros, A., *See* Foley, C.P., 20:2378
See Nick Savvides, 20:1252
See Sloggett, G.J., 20:2383
Katta, S., *See* Campbell, W.M., 20:6
Kauppila, T., *See* Watson, S.A., 20:1651
Kawamura, M., High-power test of a prototype of power supplies for UHF klystrons, 20:1571 (RA;JP;In Japanese)
Kawashima, Naoyuki, *See* Otsu, Hiroshi, 20:1925
Kawashita, K., *See* Fuck, R.A., 20:1301
Kawatra, S.K., Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)
Kawatsu, Shosi, *See* Takeda, Osamu, 20:1559
Kaye, S.M., Projection of ITER performance using the multi-machine L- and H- mode databases, 20:2423 (R;US)
Kayser, B., *See* Aleksan, R., 20:2031
Kazakov, D.I., On a possible explanation of the origin of the quark mass spectrum, 20:2098 (R;XJ)
Kazennov, A.Yu, *See* Kucherenko, A.A., 20:2507
Kearney, D., *See* Nava, P., 20:669
Kearny, D., *See* Cohen, G., 20:651
Keddy, M.D., *See* Woloshun, K., 20:1649
Keeley, D., *See* Corbett, J., 20:1608
Keeney, J.A., Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)
Keil, R., *See* Bajo, S., 20:1335
Keim, M., *See* Anne, R., 20:2248
Keir, A.M., *See* Usher, B.F., 20:2324
Keishi, Tomohiro, *See* Morii, Yasutsugu, 20:1565
Keizman, Y., Performance indicators for solar pipes with phase change storage, 20:658 (IA;IL)
Keller, H., *See* Janas, Z., 20:2226
Kellerman, B.K., Defect production and recombination during low-energy ion processing, 20:1286 (R;US)
Kelley, T.A., *See* Sampson, T.E., 20:1331
Kelly, D.L., User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations, 20:190 (R;US)
Kelly, E., *See* Wanderer, P., 20:1544

Kelly, G.L., Micro-Raman studies of wear of MG-PSZ, 20:1190 (IA;AU)
Kelly, J., *See* Schefer, R.W., 20:1426
Kelly, J.M., Interfacial friction in low flowrate vertical annular flow, 20:1465 (R;FR)
Kelly, J.W., A team leadership approach to managing the transition from construction to operations for an environmental project, 20:521 (R;US)
Kelzenberg, S., *See* Borgstedt, H.U., 20:1113
Kemp, T.J., *See* Allock, N.W., 20:1278
See Ambroz, H.B., 20:1401
Kempe, H., *See* Schaefer, L., 20:1152
Kenan, G., A comparative configuration assessment of a solar thermal plant in the Eilat area, 20:660 (IA;IL)
Efficiency measures in solar electrical production: A consistent terminology, 20:659 (IA;IL)
Kennedy, B.J., *See* Kennedy, S.J., 20:1127
Kennedy, B.W., *See* Miller, D.J., 20:1619
Kennedy, S.J., Determination of the deuterium order-disorder structure transition in Pd-$DO_{.65}$ at '50K', 20:1127 (IA;AU)
See Ersez, T., 20:1123
See Etheridge, G.T., 20:1270
See Miles, P.A., 20:2375
See Wildes, A.R., 20:1265
Kennel, E., Trends in, and current state of, forest damage surveying, 20:1954 (IA;DE;In German)
Kenney, M.E., New, high-capacity, calcium-based sorbents: Calcium silicate sorbents: Final report, 20:51 (R;US)
Kenny, M.J., *See* Wielunski, L.S., 20:2331
Kent, A.J., Edge phonoconductivity in a magnetically quantised two-dimensional electron gas, 20:1128 (IA;AU)
Kepa, H., *See* Ersez, T., 20:1123
Kettner, Ch., *See* Weber, F., 20:2025
Kettunen, L., Solutions of TEAM Problem No. 13 using integral equations in a sequential and parallel computing environment, 20:2524 (R;US)
Solutions of TEAM problems 13 and 20 using a volume integral formulation, 20:2525 (R;US)
Khachan, J., Electron spin resonance and intrinsic stress measurements on diamond synthesized by plasma assisted chemical vapour deposition, 20:1253 (IA;AU)
Khan, S., *See* Hast, C., 20:1602
Khare, G., *See* Campbell, W.M., 20:6
Khaykovich, B., Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal, 20:2384 (R;US)
Khendriche, A., *See* Vernotte, J., 20:2250
Khuri-Yakub, B.T., A study of mechanical processing damage in brittle materials: Annual progress report, April 1, 1990–March 31, 1991, 20:1175 (R;US)
A study of mechanical processing damage in brittle materials: Progress report, 20:1670 (R;US)
See Reinholdtsen, P., 20:1497
Khvastunov, M.S., Incompatibility of the generally accepted definition of a moving scale length with interval Lorentz invariance, 20:1975 (R;XJ)
Kidner, R.E., *See* Johnson, C.S., 20:189
Kiebel, G.R., Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)
Kienlin, A. von, Calorimetric low-temperature detectors on semiconductor base for the energy-resolving detection of heavy ions, 20:1629 (R;DE;In German)
Kierzek, J., Analysis of gaseous SO_2 and particulate Fe, Pb, S in air pollutants by XRF method, 20:1315 (IA;PL)
See Przetakiewicz, P., 20:1326
Kiesling, C., Physics from the first year of H1 at HERA, 20:2147 (R;DE)
Kieu, T.D., Monte Carlo simulations with indefinite and complex-valued measures, 20:2027 (R;AU)
Kihara, M., *See* Kawamura, M., 20:1571
Kijek, M.M., *See* Lee, G.N., 20:2303
Kikunaga, Toshiyuki, *See* Hayashi, Kazutaka, 20:1568
Kilgore, S.H., *See* Lanagan, M.T., 20:1478
Killen, P.D., *See* Fitzsimmons, J.R., 20:1184
See Lwin, M.J., 20:1179
Killian, E.W., *See* Femec, D.A., 20:257
Kim, B.R., Search for neutral particles in nonminimal SUSY model, 20:2189 (RA;DE)
Kim, G.H., *See* Kimura, W.D., 20:1514
Kimmich, K.C., *See* Rutledge, J.T., 20:122
Kimura, H., *See* Isobe, H., 20:1803
Kimura, W.D., Update on the ATF inverse Cerenkov laser acceleration experiment, 20:1514 (R;US)
See Pogorelsky, I.V., 20:1515, 20:1516
Kinash, T., *See* Donskov, S.V., 20:1585
King, A.G., Analytical characterization of high-level mixed wastes using multiple sample preparation treatments, 20:1333 (R;US)
King, B.V., *See* Zhang, F.M., 20:1126
King, J.D., *See* Lisowski, P.W., 20:1587
Kingsford, C.O., INEL storage facility for sealed sources from the commercial sector, 20:452 (R;US)
Kino, G.S., High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)
Kinoshita, K., Exploratory Technology Research Program for electrochemical energy storage: Executive summary report for 1993, 20:896 (R;US)
Exploratory Technology Research Program for electrochemical energy storage: Annual report for 1993, 20:897 (R;US)
See Clark, C., 20:900
Kirane, M., Behaviour at $X=\pm\infty$ of solutions to a predator-prey model, 20:2011 (R;XA)
Nonexistence of global solutions to some quasilinear hyperbolic equations with dynamic boundary conditions, 20:1977 (R;XA)
Temperature bounds in a model of laminar flames, 20:2010 (R;XA)
Kirchheiner, R., *See* Kowalski, P., 20:2570
Kirchhoff, T., *See* Albrecht, H., 20:2144, 20:2146
Kirchner, B., Operational and safety aspects of vitrified waste casks, 20:274 (IA;JP)
Safety features of proposed concepts for spent fuel dry interim storage, 20:194 (RA;XA)
Kirchner, I., Northern hemispheric response to large volcanic eruptions in relation to El Nino - winter case studies, 20:1724 (RA;US)
Kirchner, R., *See* Janas, Z., 20:2226
Kirichok, A.V., *See* Zagorodnij, A.G., 20:2413
Kirillov, I.R., *See* Evtushenko, I.A., 20:2429, 20:2430
Kirk, H.K., *See* Staple, B.D., 20:880
Kirk, W.J. III, *See* Brooks, S.L., 20:1046
Kirkbride, R.A., *See* Kupfer, M.J., 20:528
Kirkendall, J.R., 1993 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site, 20:247 (R;US)
Kirkpatrick, A., *See* Zucca, J.J., 20:713
Kirkup, L., *See* Stockton, G., 20:1212
Kiryuschin, A.I., *See* Golovko, V.F., 20:776
Kiser, D.M., Electric and Hybrid Vehicle Program: Site Operator Program: Quarterly progress report, October–December, 1993 (first quarter of fiscal year 1994), 20:1077 (R;US)
Kisorow, D.J., Photocatalytic degradation of atrazine using TiO_2-impregnated mesh, 20:1371 (R;US)
See Pugh, K.C., 20:1372
Kisi, E.H., Maximum entropy method study of the structure of Mg_2 Ni D_4 at 540 K using neutron diffraction data, 20:1188 (IA;AU)
See Kennedy, S.J., 20:1127
Kislyak, I.F., *See* Rusanov, K.V., 20:1231
Kist, R., Measuring technique of volatile hydrocarbons: Subproject: process spectrometry based on dynamical derivative technique. Status report, 20:1664 (I;DE;In German)
Kitaichi, Masatoshi, *See* Sawamura, Sadashi, 20:606
Kittler, M., Defects in multicrystalline silicon for solar cells: Defect behavior under heat treatment: Final report, 20:1114 (I;DE;In German)
Kiyanenko, V.V., *See* Topchiashvili, M.I., 20:1279
Kizukuri, Yoshiki, T-odd asymmetry in chargino pair production processes, 20:2139 (RA;DE)
Klasa, M., *See* Derome, J., 20:1711
Klassen, S.E., *See* Levy, S.C., 20:899
Klavetter, E.A., Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants, 20:317 (R;US)
Kleefisch, M.S., *See* Balachandran, U., 20:134

Kielb, H., Comparative assessment of the costs and benefits of solar thermal concentrating technologies for power generation, 20:661 (IA;IL)
Klein, A.G., *See* Allman, B.E., 20:2004
Klein, C., Laser Doppler anemometric measurement of two speed components in turbulent channel flow, 20:1470 (I;DE;In German)
Klein, M.T., Short contact time direct coal liquefaction using a novel batch reactor: Progress report, May 16, 1994–September 15, 1994, 20:39 (R;US)
Kleinitz, W., Removal of organic scales and processing of tertiary oil. Pt. 1: Removal of organic scales in watered-down wet oil probes, 20:121 (R;DE;In German)
Removal of organic scales and processing of tertiary oil. Pt. 2: Effects of wet oil produced by enhanced recovery techniques on the production and processing systems, 20:124 (R;DE;In German)
Klem, J.F., *See* Baca, A.G., 20:1505, 20:2307
Klems, J.H., A new method for predicting the solar heat gain of complex fenestration systems: II, Detailed description of the matrix layer calculation, 20:1022 (R;US)
Klepper, O., *See* Janas, Z., 20:2226
Klesse, D.A., *See* Isobe, H., 20:1803
Kley, D., Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)
Klingelhoeffer, H., *See* Rie, K.T., 20:1103
Klocke, U., *See* Kist, R., 20:1664
Kluge, H.J., Mass measurements of short-lived isotopes in traps and storage rings, 20:1630 (R;DE)
Klumpp, A., *See* Guderian, R., 20:1961
Klumpp, G., *See* Guderian, R., 20:1961
Kmetyk, L.N., CTH analyses of steel rod penetration into aluminum and concrete targets with comparisons to experimental data, 20:2026 (R;US)
Knecht, M., A possible experimental determination of m_s/m-circumflex from $K_{\mu 4}$ decays, 20:2194 (R;FR)
The reaction $\gamma\gamma \to \pi^0\pi^0$ in generalized chiral perturbation theory, 20:2166 (R;FR)
See Stern, J., 20:2195
Kneer, A., *See* Wolf, L., 20:785
Kneur, J.L., *See* Bilenky, M., 20:2115
Kniehl, B.A., *See* Barger, V., 20:2101
See Djouadi, A., 20:2104
See Hempfling, R., 20:2107
See Ilakovac, A., 20:2103
Knight, R.A., Upgrading mild gasification liquids to produce electrode binder pitch: [Quarterly] technical report, December 1, 1993–February 28, 1994, 20:38 (R;US)
Knight, R.C., *See* Adkins, H.E., 20:1005
See Wootan, D.W., 20:397
Knobel, L.L., *See* Ott, D.S., 20:1783
Knoepfle, K.T., *See* Hast, C., 20:1602
Knorr, H., Pilot programme 'Methanol-derived fuel M100': Testing of methanol-fuelled MAN city buses in different German towns. Final report, 20:1088 (I;DE;In German)
Knothe, M., *See* Kist, R., 20:1664
Ko, K., *See* Pendleton, R., 20:1613
Koahizuka, N., *See* Gu, G.D., 20:1218
Kobayashi, Shigeru, *See* Otsu, Hiroshi, 20:1925
Kobushkin, A., *See* Kostyuk, A., 20:2054
Kobylinski, T.P., *See* Balachandran, U., 20:134
Koch, A., *See* Schenkel, A., 20:1762
Koch, S., Non-intrusive measurement of temperature and velocity in free convection, 20:1468 (I;DE;In German)
Kocher, D.C., *See* Wood, D.E., 20:238
Koebel, M., Reducing nitrogen oxides in exhaust gases by means of urea. Final report, 20:1087 (R;CH;In German)
Koegler, K.J., *See* Hagood, M.C., 20:1843
Koehler, J.A., Chemical interactions between protein molecules and polymer membrane materials: Annual progress report, February 1, 1994–October 31, 1994, 20:1343 (R;US)
Koeth, I., *See* Prinz, B., 20:1809
Koga, Akihiko, *See* Morii, Yasutsugu, 20:1565
Kojuharov, D., *See* Milanov, M., 20:277
Kolanoski, H., *See* Albrecht, H., 20:2144, 20:2146
Kolb, G., *See* Cohen, G., 20:651
See Huber, W., 20:654
Kolb, G.J., *See* Chavez, J.M., 20:650
Kolstad, A.K., Investigations of radon indoors and on building sites: Radiation protection - Booklet 3, 20:1769 (R;NO;In Norwegian)
Kolter, M., Fabrication and characterization of contact layers in amorphous silicon solar cells, 20:1281 (R;DE;In German)
Koltun, M., Correct measurements of the efficiency of solar cells as a basis for their comparative techno-economical analysis, 20:662 (IA;IL)
Koltun, M.M., Evaluation of the total cost of different photovoltaic cells and combined photovoltaic-thermal solar designs for the first Russian photovoltaic 1 MW power plant, 20:663 (IA;IL)
Komatsu, K., *See* Takami, A., 20:1086
Kominek, J., *See* Ciurapinski, A., 20:1484
Kommey, J.G., *See* Hwang, R.J,, 20:990
Kon, Tadashi, Can stop be light enough for TRISTAN?, 20:2173 (RA;JP)
Konashi, Kenji, *See* Yamaguchi, Seiya, 20:1577
Konczykowski, M., *See* Khaykovich, B., 20:2384
Koningsberg, J., Evidence for $t\bar{t}$ production at the Tevatron: Statistical significance and cross section, 20:2191 (R;US)
Konno, A., *See* Hirokawa, K., 20:1936
Konno, Chikara, *See* Maekawa, Fujio, 20:2439
Kononenko, G.A., *See* Dem'yanov, A.V., 20:1555
Konttinen, J., *See* Ghazanfari, R., 20:7
Koomey, J.G., *See* Sezgen, A.O., 20:991, 20:1020
Kopyto, D., Studies on a modular high-energy photon spectrometer of pure CsI scintillators, 20:1644 (R;DE;In German)
Korenman, G.Ya., Inelastic collisions of negative muons and hadrons with metastable hydrogen atoms, 20:2290 (R;XJ;In Russian)
Inelastic collisions of negative muons and hadrons with Helium metastable atoms, 20:2291 (R;XJ;In Russian)
Korennov, S.V., *See* Filippov, G.F., 20:2217
Korkka-Niemi, K., Nationwide rural well water survey: The quality of household water and factors influencing it, 20:1842 (R;FI;In Finnish)
Kornegay, F.C., *See* Fricke, K.E., 20:544
Korotkiyan, V., *See* Efremov, A., 20:2087
Korycki, J., *See* Starosta, W., 20:2358
Korzhik, M.V., Spectroscopy and origin of radiating centers in $PbWO_4$ single crystals, 20:1282 (R;FR)
Kosaki, A., *See* Yamakawa, H., 20:207
Kosako, Kazuaki, *See* Maekawa, Fujio, 20:2439
Kosche, A., *See* Albrecht, H., 20:2144, 20:2146
Koshizuka, N., *See* Anderson, A.R., 20:1205
See Godamanne, G., 20:1203
See Miles, P.A., 20:2375
See Zhao, Y., 20:1260
Koshizuka, Naoki, Magnetic properties of Y 124 and Bi 2212 superconductors, 20:1262 (IA;AU)
Koshyk, J.N., Potential vorticity dynamics in the Canadian Climate Centre GCM, 20:1725 (RA;US)
Kosov, D.S., *See* Vdovin, A.I., 20:2220
Koss, L.L., *See* Luo, H.H., 20:1197
Kostelnik, A.J., Acceptance test report for 241-AW process air system, 20:375 (R;US)
Kostidis, L., Low pressure growth of diamond films, 20:1182 (IA;AU)
Kostin, O.A., *See* Matsakova, A.A., 20:1224
Kostroun, V.O., Experimental study of interactions of highly charged ions with atoms at keV energies: Progress report, February 16, 1993–April 15, 1994, 20:2288 (R;US)
Kosturkov, L., Implementation of systematic training approach in Kozloduy Training Centre - Current situation. Presentation of Bulgaria, 20:2496 (RA;XA)
Kostyuk, A., On validity of perturbative quantization of the breathing mode in the Skyrme model, 20:2054 (R;UA)
Kothe, D.B., *See* Padial, N.T., 20:1475
See Rider, W.J., 20:1476
Kotok, L.A., *See* Dejneka, T.G., 20:1225
See Malikov, V.Ya., 20:1227
Kottke, I., Reaction and interaction of mycorrhizae and rhizosphere, 20:1958 (IA;DE)
Kotwal, A.V., Recent results from E665, 20:2156 (R;US)
Kouachi, S., *See* Kirane, M., 20:1977

Kouprina, N., *See* Larionov, V., 20:1866
Kovalenko, S.G., *See* Altajskij, M.V., 20:2057
Kovalyov, A., Information on the projects of technical assistance in personnel training for Russian NPPS. Presentation of Russia, 20:2506 (RA;XA)
Kovar, P., The Czech Republic Nuclear Power Programme present situation and its development, 20:2470 (RA;XA)
The Czech Republic programme and experiences on training and qualification for NPPs personnel, 20:2499 (RA;XA)
Kovtun, G.P., *See* Okovit, V.S., 20:1142
Kowalczyk, D., *See* Coutelle, R., 20:719
Kowalenko, V., Asymptotics for the Kummer function of Bose plasmas, 20:2003 (R;AU)
See Daicic, J., 20:2069, 20:2070, 20:2398
Kowalska, E., An attempt of determination of heavy metals content in environmental samples by low resolution XRF technique, 20:1316 (IA;PL)
Kowalska-Loth, B., *See* Buraczewska, I., 20:1922
See Gradzka, I., 20:1921
Kowalski, K.A., *See* Walker, E.W. Jr., 20:1461
Kowalski, P., Development of a relational database for rated values of metallic materials: Final report, 20:2570 (I;DE;In German)
Kownacki, P., *See* Humphries, D., 20:1604
Kozhuharov, C., *See* Czajkowski, S., 20:2246
Kozlowska-Milner, E., Pulse radiolysis of acetonic solutions in presence of silver salts, 20:1406 (IA;PL)
Kozyr, A., *See* Chipman, D.W., 20:1857
Krabbe, N., Choice, examination and test of small wind power stations for developing countries: Final report about the test in Kaiser-Wilhelm-Koog, 20:720 (R;DE;In German)
Krakauer, D., *See* Derrick, M., 20:2145
Kralik, B., Correlated wavefunction Monte Carlo studies of excitations in the quantum Hall liquids, 20:2397 (R;US)
Kramer, W.E., Performance testing of the AC propulsion ELX electric vehicle, 20:1078 (R;US)
Kraner, H.W., Influence of oxidation on radiation hardness of silicon detectors, 20:1616 (R;US)
Kras, J., *See* Zukowska-Cwik, G., 20:596
Krasavin, E.A., *See* Waligorski, M.P.R., 20:1920
Krastev, P.I., Boron neutrino flux and the MSW solution of the solar neutrino problem, 20:2149 (R;US)
Krause, G.H.M., *See* Prinz, B., 20:1809
Krauss, A.R., *See* Lin, Yuping, 20:1291
Kravitz, S.H., *See* Vawter, G.A., 20:1668
Kreis, J., A method of simulating the inflammation phase of spark ignition engines, 20:1065 (I;DE;In German)
Krejzler, J., *See* Borkowski, M., 20:1317
Kreutzer, K., The effects of acid irrigation and compensation liming on soil and trees in a mature Norway spruce stand (Hoeglwald project), 20:1811 (IA;DE)
Kribus, A., On the optimization of the solar-driven combined cycle, 20:664 (IA;IL)
Krishnamurthy, R., *See* Shieh, A.S., 20:877
Kristensen, P.E., *See* Joergensen, O.B., 20:697
Kroh, J., Electron interaction with stabilizing matrix, 20:1383 (IA;PL)
Kroll, N., *See* Neubauer, M., 20:1614
Kromar, M., *See* Ravnik, M., 20:204
Kruchinin, S.P., Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
Krueger, M., Car power supply with fast synchronous generator, 20:1082 (I;DE;In German)
Krueger, O., Support of the EMEP-project: European wide depositions of sulphur and nitrogen compounds as a consequence of sulphur, nitrogen oxides and ammonia emissions, 20:1745 (R;DE;In German)
Kruger, A.A., Glass science tutorial: Lecture #2, Operating electric glass melters, 20:331 (R;US)
Glass science tutorial: Lecture #1, Chemistry and properties of oxide glasses, 20:1290 (R;US)
Krumpelt, M., A fuel cell overview, 20:1006 (R;US)
Kruszewski, M., *See* Waligorski, M.P.R., 20:1920
Krut, D.D., Si concentrator solar cell development: [Final report], 20:692 (R;US)
Krynicki, J., Defects in epitaxial GaInP, 20:1219 (IA;PL)
See Rzewuski, H., 20:2356
Kryter, R.C., *See* Booth, R.S., 20:882
Kryvoruka, J.K., Roll control resonance test vehicle (RCRTV) system postflight evaluation report, 20:1034 (R;US)
SPINFIN: A computer program for trajectory simulation of flight vehicles with semi-passive roll control systems, 20:1686 (R;US)
Krzyminiewski, R., Conversion of free radicals upon annealing of x-irradiated single crystal of cholest-4-en-3-one, 20:1385 (IA;PL)
See Szyczewski, A., 20:1354
Kubo, T., *See* Kawamura, M., 20:1571
Kubota, C., *See* Kawamura, M., 20:1571
Kuchelka, R., *See* Catchpole, G., 20:480
Kucherenko, A.A., ENIKO MIFI theses for discussion on implementation of training assistance, 20:2507 (RA;XA)
See Saakov, E.S., 20:2481
Kuchiev, M.Yu., Long-range two-hole bound states in the t-J model, 20:2369 (IA;AU)
See Flambaum, V.V., 20:2366
Kuckshinrichs, W., *See* Hake, J.F., 20:918
Kudo, K., *See* Kawamura, M., 20:1571
Kuehn, J.H., *See* Jezabek, M., 20:2076, 20:2120, 20:2126, 20:2127
Kuehnel, V., *See* Stepan, D.J., 20:139
Kuenstler, W., *See* Gorenflo, D., 20:1473
Kuepper, K., Fuzzy modelling of a gas furnace, 20:1494 (I;DE;In German)
Kugeler, K., Development of an inactive heat removal system for high temperature reactors, 20:784 (RA;XA)
Principles of decay heat removal in reactor technology - Present status and future prospects, 20:744 (RA;XA)
Kuhn, M., Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Kuklin, V.M., *See* Zagorodnij, A.G., 20:2413
Kukulin, V.I., *See* Peresypkin, V.V., 20:2230
Kulatunge, S.S., *See* Devendra, R., 20:586
Kulessa, R., *See* Rotbard, G., 20:2244
Kulisa, K., The possibility of application of ion chromatography for the determination of nitrogen and sulfur oxides and some other compounds in combustion flue gases after electron beam treatment, 20:591 (IA;PL)
See Wasek, M., 20:1324
Kumar, A.S., *See* Schubert, L.E., 20:1162
Kumar, M.P.S., *See* Adzic, G.D., 20:895
Kumar, N., Condensate localization by mesoscale disorder in high-T_c superconductors, 20:2364 (R;XA)
Kumar, S., Growth and properties of carbon nitride thin films, 20:1215 (IA;AU)
Kunde, G.J., Fragment flow and the multifragmentation phase space, 20:2239 (R;DE)
Kunze, W.D., *See* Kunde, G.J., 20:2239
Kuperman, M.N., *See* Wio, H.S., 20:2016, 20:2017
Kupfer, M.J., Interim data quality objectives for waste pretreatment and vitrification: Revision 1, 20:528 (R;US)
Kupperman, D.S., *See* Lanagan, M.T., 20:1478
Kuppler, D., *See* Deimel, P., 20:1118
Kurashima, C., *See* Hirokawa, K., 20:1936
Kurn, D.M., The potential for reducing urban air temperatures and energy consumption through vegetative cooling, 20:992 (R;US)
Kurnit, N.A., *See* Pogorelsky, I.V., 20:1516
Kury, R., *See* Carlton, W.H., 20:1778
Kusche, K.P., *See* Kimura, W.D., 20:1514
Kushashvili, Zh.K., *See* Topchiashvili, M.I., 20:1279
Kushnir, Y., Atlantic interdecadal ocean-atmosphere interaction, 20:1848 (RA;US)
Kuzavkov, N.G., *See* Golovko, V.F., 20:776
Kuznetsov, A.A., *See* Dedovich, T.G., 20:2263
Kvichko, L.A., *See* Malikov, V.Ya., 20:1227
Kwan, J.W., A 2.5 MeV electrostatic quadrupole dc accelerator for BNCT application, 20:1890 (R;US)
Kwok, K.S., Real-time dynamic simulator for the Topaz II reactor power system, 20:792 (R;US)
Kyd, D.R., Mass media and nuclear energy - IAEA's role, 20:959 (I;XA)
NPT safeguards and the peaceful use of nuclear energy, 20:946 (I;XA)
Opening remarks, 20:949 (I;XA)

Kyoizumi, Seishi, The SCID-hu mouse and its application to human radiation biology: Analysis of sensitivity to X-irradiation using a bone marrow model, 20:1933 (RA;JP;In Japanese)
Kyrki-Rajamaeki, R., Validation of the reactor dynamics code HEXTRAN, 20:767 (R;FI)

L

La Robina, M., *See* Bowden, G.J., 20:2376
Laakso, K., *See* Haenninen, S., 20:753
Lacerda, A., *See* Cooley, J.C., 20:1232
Lada, W., *See* Deptula, A., 20:1220
Ladygin, V.P., *See* Sitnik, I.M., 20:2258
Laemmer, H., Discussion of plastic instabilities of a pressure vessel by means of the finite element method, 20:809 (R;DE;In German)
Lagasse, R.R., *See* Levy, S.C., 20:899
Lahti, K., *See* Korkka-Niemi, K., 20:1842
Laird, J.S., Scanning deep level transient spectroscopy using an MeV ion microprobe, 20:2327 (IA;AU)
Laird, R., *See* Lisowski, P.W., 20:1587
Lam, S., *See* Foley, C.P., 20:2378
Lamberd, D.L., Waste Receiving and Packaging, Module 2A, Supplemental Design Requirements Document, 20:360 (R;US)
WRAP 2A advanced conceptual design report comments, 20:359 (R;US)
Lamble, R.W., *See* DiCenso, A.T., 20:395
Lammer, M., Progress in fission product nuclear data. No. 14: Information about activities and requirements in the field of measurements and compiliations/evaluations of fission product nuclear data (FPND), 20:2242 (R;XA)
LaMontagne, J., Estimating the impacts of federal efforts to improve energy efficiency: The case of buildings, 20:1013 (R;US)
Lampe, B., Azimuthal distributions for the process $e^+e^- \rightarrow t$ anti $t \rightarrow \mu^+\mu^- X$, 20:2124 (RA;DE)
Lanagan, M.T., High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
See Goretta, K.C., 20:1168
Landaud, G., *See* Bedjidian, M., 20:2385
Landsman, N.P., Massless particles, electromagnetism, and Rieffel induction, 20:2077 (R;DE)
Lange, A., *See* Albrecht, H., 20:2144, 20:2146
Lange, M.G., *See* Niessen, H.F., 20:787
Lange, O.L., *See* Heber, U., 20:1963
See Pfanz, H., 20:1965
Langebartels, C., *See* Sandermann, H. Jr., 20:1964
Langner, A., Energy supply on community level between communal and external supply concepts: Tasks and limits, problems and concepts of energy supply in urban and rural districts. Documentation, 20:1056 (I;DE;In German)
Langner, J., *See* Ciurapinski, A., 20:1484
Lannon, K., Unbinned maximum likelihood fit for the CP conserving couplings for W + photon production at CDF, 20:2030 (R;US)
Lanyi, P., *See* Bett, A., 20:683
Laohawilai, S., Spectrophotometric determination of inactive molybdenum in sodium pertechnetate (technetium-99m) for injection, 20:1311 (IA;TH;In Thai)
Lapina, N.V., *See* Tikhonovskij, M.A., 20:1223
See Tortika, A.S., 20:1230
Larl, P., Piercing tool, Transportation Accident Resistant Container (TARC), 20:1449 (R;US)
Larionov, V., Transformation-associated recombination between diverged and homologous DNA repeats is induced by strand breaks, 20:1866 (R;US)
Larkin, A.I., *See* Khaykovich, B., 20:2384
Larsen, M.E., MELTER: A model of the thermal response of cargos transported in the Safe-Secure Trailer subject to fire environments for risk assessment applications, 20:208 (R;US)
Larsson, S.Aa., Tectonic regimes in the Baltic Shield during the last 1200 Ma - A review, 20:1837 (R;SE)
Lasaga, A.C., Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)
Latif, M., Causes of decadal climate variability over the North Pacific and North America, 20:1752 (R;DE)
Interactions of the tropical oceans, 20:1754 (R;DE)
Lavender, J.C., Hanford Generic Interim Safety Basis, 20:341 (R;US)
Lavialle, G., *See* Dumont, D., 20:758
Lavrinenko, S.D., *See* Okovit, V.S., 20:1229
Layssac, J., Strong resonances effects at future e^+e^- colliders, 20:2133 (RA;DE)
Lazanu, S., *See* Kraner, H.W., 20:1616
Le Beyec, Y., *See* Boussofiane-Baudin, K., 20:2359
Le Faou, J.H., Towards limiting temperatures in nuclei: The behaviour of collective motion, 20:2212 (R;FR)
See Suomijaervi, T., 20:2209
Lear, K.L., Technologies for highly parallel optoelectronic integrated circuits, 20:2557 (R;US)
Leboeuf, P., *See* Bogomolny, E., 20:1993
Lebrun, M.J., *See* Yagi, M., 20:2405
Leciejewicz, J., Magnetism of lanthanide intermetallic compounds, 20:1221 (IA;PL)
See Allock, N.W., 20:1278
Leckey, R., *See* Con Foo, Jenice, 20:2392
Leckey, R.C.C., *See* Bocquet, A.E., 20:2321
Leckey, R.C.G., *See* Sheils, W., 20:2302
LeClair, M.D., Waste Receiving and Processing Module 2A waste certification strategy, 20:361 (R;US)
See Lamberd, D.L., 20:360
Lecoq, J., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Lecoq, P., The acceptance, before transport, of the waste radioactive packages on the disposal facilities of ANDRA, 20:275 (IA;JP)
LeCren, R.T., Advanced coal-fueled industrial cogeneration gas turbine system – combustion development, 20:81 (R;US)
Lederman, L., IAEA programmes on the safety of nuclear power plants in Easter Europe and countries of the former Soviet Union, 20:2493 (RA;XA)
Lee Byong Whi, Nuclear development in Korea, 20:947 (I;XA)
Lee, B.L. Jr., Validation of Nuclear Criticality Safety Software and 27 energy group ENDF/B-IV cross sections, 20:1443 (R;US)
Lee, B.S., The effects of aging on BWR core isolation cooling systems, 20:878 (R;US)
Lee, E.S., *See* Beltran, L.O., 20:1021
Lee, G.N., An application of X-Ray computerized tomography for examining the internal features of materials, 20:2303 (IA;AU)
Lee, M.P., *See* McConnell, K.I., 20:292
Lee, S.R., Reciprocal space mapping of epitaxial materials using position-sensitive x-ray detection, 20:1673 (R;US)
Lee, S.W., Analysis/control of in-bed tube erosion phenomena in the fluidized bed combustion (FBC) system, 20:1490 (R;US)
Investigation of heat transfer and combustion in the advanced Fluidized Bed Combustor (FBC): Technical progress report No. 3, April 1, 1994–June 30, 1994, 20:1491 (R;US)
Lee, S.Y., *See* Watkins, D.R., 20:224
Lee, T.A., *See* Mortimore, J.A., 20:462
Lee, Y.K., Radiation shielding calculation for the MOX fuel fabrication plant Melox, 20:814 (R;FR)
Leemans, W.P., *See* van der Geer, B., 20:1524
Lefohn, A.S., *See* Mohnen, V.A., 20:1757
Legge, G.J.F., *See* Laird, J.S., 20:2327
Lehmann, G., Design, construction and testing of a rotary kiln for the thermal treatment of contaminated soils: Final report, 20:129 (I;DE;In German)
Lehtovaara, A., *See* Ghazanfari, R., 20:7
Leike, A., Model independent constraints on extra Z bosons at a 500 GeV e^+e^- collider, 20:2130 (RA;DE)
Leinauer, A., Presentation of Germany, 20:2501 (RA;XA)
Leino-Forsman, H., *See* Pitkaenen, P., 20:1861
Leischner, K., Calibration of simulated temperature histories of sedimentary basins, 20:104 (R;DE;In German)
Leist, K.J., Aerosol can puncture device operational test plan, 20:356 (R;US)
Leleux, G., Dimensions resulting from $\delta\Phi_s.\delta(\Delta E)_L$ defects, 20:1518 (R;FR;In French)
Final energy dependence on phase fluctuations $\delta\Phi_s$ and on the level of $(\Delta E)_L$, 20:1519 (R;FR;In French)

Lemaire, M.C., *See* Rousteau, S., 20:2161
Lemke, R.W., *See* Coleman, P.D., 20:1509
Lemmel, H.D., Index of nuclear data libraries available from the IAEA Nuclear Data Section, 20:2571 (R;XA)
Lemonnier, H., Droplet size and velocity at the exit of a nozzle with two-component near critical and critical flow, 20:1463 (R;FR)
Lenhardt, B.W., *See* Zawicki, L.R., 20:1500
Lennon, W.J., High speed optical links between LLNL and Berkeley, 20:2565 (R;US)
Lerch, M.L.F., Quantum well plasma effects in the tunneling current through a semiconductor double barrier structure, 20:2344 (IA;AU)
Lerner, B., *See* Campbell, J.A., 20:302
Lerner, B.D., *See* Ligotke, M.W., 20:308
Lerner, J., *See* Shagam, R.N., 20:1033
Lesniak, L., *See* Cannata, F., 20:2193
See Kaminski, R., 20:2163
Lesser, J.E., Facility effluent monitoring plan for the B plant, 20:324 (R;US)
Lester, C.S., *See* Shimada, Tsutomu, 20:1765
Levendis, Y.A., Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)
Levin, Y., Study of the simplest realistic Higgs sector in quark-lepton symmetric models, 20:2183 (R;AU)
Levine, D., *See* Kettunen, L., 20:2524, 20:2525
Levine, T.E., *See* Yu, N., 20:1237
Levins, W.P., Energy efficiency in military family housing: Inspection results, 20:1030 (R;US)
Levy, M., Comparative studies of direct and indirect absorption of concentrated solar flux for chemical storage of solar energy, 20:665 (IA;IL)
Levy, S.C., Thin flexible intercalation anodes, 20:899 (R;US)
Lewis, G.K., Directed light fabrication, 20:1155 (R;US)
Lewis, J., Measurement of the B cross section at CDF via B semileptonic decays, 20:2151 (R;US)
Lewis, R.A., *See* Piao, G., 20:1264
Lewis, R.E., Eielson Air Force Base operable unit 2 and other areas record of decision, 20:1829 (R;US)
Lewis, W.R., *See* Smith, R.I., 20:822
Ley, L., *See* Bocquet, A.E., 20:2321
Leyval, L., *See* Montmain, J., 20:163
Lheureux, R., Safety criteria and provisions for the evacuation of residual heat from graphite gas cooled reactors, 20:771 (RA;XA)
Li, D.G., Cleavage luminescence in semiconductors, 20:1189 (IA;AU)
Li, Hongshuo, Magnetic properties of a novel Pr-Fe-Ti phase, 20:1133 (IA;AU)
Magnetic properties of novel ternary phase: Sm_3 $(Fe_{1-x}$ $Ti_x)_{29}$ $(0.04 \leq x \leq 0.06)$, 20:1131 (IA;AU)
See Cadogan, S.J.M., 20:1134
See Harker, S.J., 20:1138
See Reza, K.A., 20:1132
See Xu, Jianmin, 20:1124
Li, J.N., Anomalous flux pinning by twin boundaries in single-crystalline YBa_2 Cu_3 O_7, 20:2379 (IA;AU)
Li, Xiao-Ping, *See* Wei, Jie, 20:1527
Li, Z., *See* Kraner, H.W., 20:1616
Licki, J., *See* Chmielewski, A.G., 20:599
See Zimek, Z., 20:601
Liekhus, K.J., Characterization of void volume VOC concentration in vented TRU waste drums - an interim report, 20:261 (R;US)
Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data, 20:256 (R;US)
Liesegang, J., *See* Jiang, Z.T., 20:1266
Lietzke, D.A., *See* Watkins, D.R., 20:224
Ligeza, M., *See* Panczyk, E., 20:1314
Lightner, R., The US DOE Environmental Restoration Program – a Washington perspective, 20:976 (RA;US)
Ligotke, M.W., Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994), 20:308 (R;US)
Ligun, V.A., *See* Korzhik, M.V., 20:1282
Lilkala, T.L., Hydrogeology along the southern boundary of the Hanford Site between the Yakima and Columbia Rivers, Washington, 20:1830 (R;US)
Lilholt, H., *See* Andersen, S.I., 20:723
Liljegren, L.M., *See* Bamberger, J.A., 20:297
Lilley, A., *See* Flowers, L., 20:1001
Lim, C.S., *See* Long, G.M., 20:2336
Lim, M., The initial thermo-instability of the Al-Cu-Mg-Ag supersaturated solid solution, 20:1125 (IA;AU)
Limohpasmanee, W., *See* Kaochoung, P., 20:1902
Lin, H., *See* Derome, J., 20:1711
Lin, H.T., Creep behavior in SiC whisker-reinforced alumina composite, 20:1240 (R;US)
Lin, S.W., *See* Sun, D.Z., 20:1181
Lin, W., A large block heater test for high level nuclear waste management, 20:322 (R;US)
Lin, Yuping, Atmosphere influence on in situ ion beam analysis of thin film growth, 20:1291 (R;US)
Lindberg, S.E., Application of surface analysis methods to studies of atmospheric deposition in forests, 20:1759 (IA;DE)
Lindgren, M., *See* Salih, N.A., 20:1392
Lindman, E.L., Effects of plasma physics on capsule implosions in gas-filled hohlraums, 20:2441 (R;US)
Lindner, A., *See* Albrecht, H., 20:2144, 20:2146
Lindquist, M.R., *See* Chen, W.W., 20:1453
Lindqvist, P.A., Plasma characteristics determined by the Freja electric field instrument, 20:2426 (R;SE)
Lindsay, D.C., TWRS corrosion monitoring program plan, 20:403 (R;US)
Lindsey, K.A., Geologic setting of the low-level burial grounds, 20:340 (R;US)
Lindstedt, D.M., *See* Eggington, W.J., 20:120
Lindzen, R.S., *See* Sun, D.Z., 20:1736
Linecki, J., Radiation and health, 20:1886 (IA;PL)
Lingjaerde, R.O., Nuclear power - status and development 1994, 20:797 (R;NO;In Norwegian)
Linschooten, C.G., *See* Wootan, D.W., 20:397
Linscott, I., *See* Corbett, J., 20:1608
See Fox, J.D., 20:1612
Lipinski, R.J., Applications for reactor-pumped lasers, 20:1508 (R;US)
Lipinski, R.M., Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)
Lipka, G., *See* Miller, D.R., 20:514
Lippert, T.E., *See* Dennis, R.A., 20:18
See Newby, R.A., 20:9, 20:10
Lis, S., *See* Szyczewski, A., 20:1354
Lisauskas, R.A., *See* Carson, R.D., 20:14
Lisetskij, A.F., *See* Filippov, G.F., 20:2229
Lisowski, P.W., Confirmatory experiments for the United States Department of Energy Accelerator Production of Tritium Program: Neutron, triton and radionuclide production by thick targets of lead and tungsten bombarded by 800 MeV protons, 20:1587 (R;US)
Liszewski, M.J., Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91, 20:451 (R;US)
Litvak, A.G., Strong phase correlations of solitons of nonlinear Schroedinger equation, 20:1983 (R;XA)
Liu Manhui, Coal pricing in a centrally controlled, planned economy - the example of the People's Republic of China, 20:982 (I;DE;In German)
Liu, H.K., Microstructure development and phase transformation of Ag-sheathed BI-2223 tapes, 20:1192 (IA;AU)
See Dou, S.X., 20:1120
See Guo, Y.C., 20:1193
See Li, Hongshuo, 20:1131
See Matthews, D.N., 20:1206
See Muller, K.H., 20:2382
See Xia, J.A., 20:1194
See Xu, Jianmin, 20:1124
Liu, M., Thermal expansion of V_3 Si with controlled martensite-phase morphology, 20:1130 (IA;AU)
Liu, Y., *See* Pogorelsky, I.V., 20:1515

Livengood, C.D., *See* Doctor, R.D., 20:59
Ljungdahl, L.G., *See* Peck, H.D. Jr., 20:1846
Lkhagva, O., *See* Korenman, G.Ya., 20:2290, 20:2291
Lloret, R., Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants, 20:755 (R;FR;In French)
Lobb, J., *See* Miller, D.J., 20:1269
Lockrem, L.L., *See* Rebagay, T.V., 20:420
Lofgren, E.J., The principle of phase stability and the accelerator program at Berkeley, 1945–1954, 20:1523 (R;US)
Lograsso, T.A., *See* Ellis, T.W., 20:1143
Lohmann, M., *See* Bellman, R., 20:928
Lohnert, G.H., The ultimate safety of the HTR-Module during hypothetical accidents, 20:773 (RA;XA)
Lohrstorfer, C.F., *See* Bassett, R.L., 20:1824
Lohry, E.J., *See* Nguyen, D.T., 20:1105
Loika, E.F., Advanced reactors transition fiscal year 1995 multi-year program plan WBS 7.3, 20:870 (R;US)
Loktev, V.M., Polarization and intensity of d d-transitions in superconducting copper oxides, 20:1235 (R;UA)
Lommler, J.C., Tailings remediation at UMTRA Project Sites: Engineering practices, 20:482 (RA;US)
Long, D.D., *See* Tingle, A.R., 20:1821
Long, G.M., Oxygen stoichiometry measurements in polycrystalline $YBa_2 Cu_3 O_{7-x}$ by Micro-Raman spectroscopy, 20:2336 (IA;AU)
Long, J.B., Final report - Sundyne Company, 20:696 (R;US)
Loomis, B.A., *See* Chung, H.M., 20:1100
Loosz, T., *See* Hoffman, E.L., 20:1703
Looz, T., *See* Hoffmann, E.L., 20:1702
Lopez-Fernandez, A., *See* Eboli, O.J.P., 20:2105
Lorenz, J.C., *See* Holcomb, D.J., 20:123
Lottner, V., IEA Implementing Agreement: energy conservation through energy storage. Annex 5: Full scale latent heat storage installations. Final report, 20:893 (I;DE)
Louie, S.G., *See* Kralik, B., 20:2397
Louthan, M.R. Jr., Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)
Lovejoy, M.L., *See* Howard, A.J., 20:1507
See Shul, R.J., 20:1287
Lowe, D.B., Magnetization studies of superconducting V_3 Si, 20:2371 (IA;AU)
Lu Yanxiao, Development of radiation utilization for economic growth in China, 20:2511 (IA;JP)
Nuclear techniques in agriculture and industry in China, 20:954 (I;XA)
Lu, C., Potential vorticity dynamics for global scale circulations, 20:1727 (RA;US)
Lu, Shin-yee, An image cancellation approach to depth-from-focus, 20:2562 (R;US)
Lu, Zheng-Tian, Laser trapping of ^{21}Na atoms, 20:2007 (R;US)
Lucas, D.R., *See* Hinkle, A.W., 20:353
Lucke, R., *See* Campbell, J.A., 20:302
Lugar, R.M., Results of monitoring for PCDDs and PCDFs in ambient air at McMurdo Station, Antarctica, 20:1749 (R;US)
Results of PM_{10} and TSP monitoring at McMurdo Station, Antarctica, 20:1751 (R;US)
Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica, 20:1750 (R;US)
See White, G.J., 20:1792
Lujan, R.E., *See* Black, S.J., 20:1002
Lukac, I., *See* Kallies, W., 20:2000
Lukasiewicz, A., Investigation of structures and properties of new materials from amino triazole complexes of transition metals, 20:1361 (IA;PL)
Lukasiewicz, J., *See* Maciszewski, W., 20:1553
Lukins, P.B., *See* Khachan, J., 20:1253
Lumjiactas, S., *See* Soodprasert, T., 20:585
Lumpkin, G.R., *See* Lumpkin, N.E., 20:1137
Lumpkin, N.E., Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures, 20:1137 (IA;AU)
Lund, A., *See* Salih, N.A., 20:1392
Lundberg, L.B., Corrosion of spent Advanced Test Reactor fuel, 20:816 (R;US)
Lunn, B., *See* Usher, B.F., 20:2324
Lunsford, T.R., Clean Salt integrated flowsheet, 20:384 (R;US)
See Herting, D.L., 20:416
Luo, H., *See* Chen, A.L., 20:1283
Luo, H.H., Piezoelectric ceramic/polymer composites for dumping of mechanical vibrations, 20:1197 (IA;AU)
Lupo, A.R., Climatological features of blocking anticyclones, 20:1726 (RA;US)
Lustenberger, P., *See* Ederhof, A., 20:1472
Luthra, K.L., *See* Corman, G.S., 20:1063
Luttrell, C.R., *See* Swinson, W.F., 20:607
Luttrell, G., *See* Yoon, R.H., 20:5
Luttrell, S.P., *See* Dresel, P.E., 20:466
Lutz, F., *See* Bett, A., 20:683
Lutz, J.D., *See* Gundiler, I.H., 20:318
Lwin, M.J., A shock-Hugoniot for $Sm_2 Fe_{17} N_x$ powder, 20:1179 (IA;AU)
Lyman, J.L., *See* Martin, A.D., 20:1665
Lynn, R.Y.S., Prototype integration of the joint munitions assessment and planning model with the OSD threat methodology, 20:1678 (R;US)
Lysenko, W.P., Moment approach to high-order accelerator beam optics, 20:1539 (R;US)
Lysov, G.W., *See* Zimek, Z., 20:601
Lystrup, Aa., *See* Andersen, S.I., 20:723

M

Ma'ly, A., *See* Bilewicz, A., 20:1319
Ma, Long, *See* Chen, Wei-Yin, 20:69
Maass, K., Photovoltaic solar filling station Hannover Fair 1988: Final report, 20:1079 (R;DE;In German)
Mabuchi, Hisao, Isotopic approach to the provenance study of artifacts, 20:1302 (IA;JP;In Japanese)
Mabuchi, Kiyohiko, Cancer incidence in the atomic bomb survivors, 20:1938 (RA;JP;In Japanese)
MacDowall, R.D., *See* Kramer, W.E., 20:1078
MacFarlane, R.E., New thermal neutron scattering files for ENDF/B-VI release 2, 20:2266 (R;US)
Machado Junior, M.A., Importance of the use of gadolinium in neurocysticercosis diagnosis, 20:1875 (I;BR;In Portuguese)
Migrational disorders: a review of 13 cases. Computed tomography and Magnetic resonance imaging, 20:1876 (I;BR;In Portuguese)
Tomographic criteria of gliomas in the brain stem in infants, 20:1877 (I;BR;In Portuguese)
Machaj, B., *See* Antoniak, W., 20:1640
See Zakrzewska, D., 20:602
Machavariani, A.I., Conserved currents for ed-e' N N, ed-e'd' and γd - N N reactions in the framework of three-dimensional field theoretical formulation, 20:2261 (R;XJ)
Machi, S., Application of isotopes and radiation for industry and environmental protection, 20:588 (IA;PL)
Highlights of IAEA activities in the field of radiation application, 20:2510 (IA;JP)
Maciszewski, W., Control and data acquisition system of electron linear accelerator for radiation processing, 20:1553 (IA;PL)
MacKay, M.D., Wave-mean flow interaction and the baroclinic adjustment hypothesis, 20:1728 (RA;US)
Macks, L.D., *See* Ricketts, B.W., 20:1273
Macpherson, J.A., Nuclear information and education experience in Canada, 20:952 (I;XA)
Public information and education in Canada, 20:944 (I;XA)
Maddison, D.S., External control of microwave properties of dielectric materials, 20:1211 (IA;AU)
Maddison, G.P., Recycling source terms for edge plasma fluid models and impact on convergence behavior of the BRAAMS 'B2' code, 20:2440 (R;DE)
Maddock, R.H., Direct fault dating trials at the Aespoe Hard Rock Laboratory, 20:1836 (R;SE)
Madhok, V., A survey of artificial neural network applications in flow analysis of energy networks, 20:2546 (R;US)
Utilizing artificial neural networks in netwsork flow analysis: An annotated bibliography, 20:2547 (R;US)
Madkour, M.A.I., *See* Mohammed, F.A., 20:821

Madsen, G., Energy and the environment: Investigation carried out by the Energy Conservation Committee on the attitudes and behaviour of the public in relation to environmental protection and energy conservation, 20:979 (R;DK;In Danish)
Madsen, J.O., Quantum Hamiltonian reduction in superspace formalism, 20:2063 (R;FR)
Maduekwe, A.A.L., Atmospheric turbidity and the diffuse irradiance in Lagos, Nigeria, 20:1747 (R;XA)
Predicting the components of the total hemispherical solar radiation from sunshine duration measurements in Lagos, Nigeria, 20:641 (R;XA)
Maekawa, Fujio, Benchmark experiment on a copper slab assembly bombarded by D-T neutrons, 20:2439 (R;JP)
Maekawa, Hiroshi, *See* Maekawa, Fujio, 20:2439
Magelssen, G.R., *See* Lindman, E.L., 20:2441
Mager, D., Economics, funding and the influence of politics on the Wismut Program, 20:907 (RA;US)
See Nelson, R.A., 20:975
Maggiore, C.J., *See* Quagliano, J.R., 20:1503
See Yu, N., 20:1237
Magill, S., *See* Derrick, M., 20:2145
Magnuson, S.O., *See* Martian, P., 20:259
Magnussen, O.M., *See* Ocko, B.M., 20:2309
Mahajan, S.M., *See* Berezhiani, V.I., 20:2409
See Sauers, I., 20:887
Mahapatra, S., Tachyon condensates and anisotropic universe, 20:2037 (R;XA)
Mahlum, D.D., Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)
Mahmoud, M., *See* Souka, N., 20:1377
Maillet, J.P., *See* Kaminski, R., 20:2163
Maison, J.M., *See* Vernotte, J., 20:2250
Maiya, P.S., *See* Balachandran, U., 20:134
Major, D., *See* Khaykovich, B., 20:2384
Major, E.L., *See* Zucca, J.J., 20:713
Majerotto, W., *See* Bartl, A., 20:2136
Malatidis, N.A., Development and testing of an integrated collector-latent heat storage for solar service water heating: Final report, 20:704 (I;DE;In German)
Malato, S., Photo catalysis and radiation absorption in a solar plant, 20:666 (IA;IL)
Malek, F., *See* Bedjidian, M., 20:2385
Malesys, P., Characterization of the back-end wastes in view of their transportation, 20:273 (IA;JP)
Maletic, D., *See* Haffmans, A.F., 20:1529
Malgouyres, P., *See* Cruz, D., 20:1481
Malhotra, R., *See* Hirschon, A.S., 20:631, 20:632
Malikov, V.Ya., Variation of properties of the HTSC ceramic doped by silver., 20:1227 (IA;UA;In Russian)
Malkemus, D.W., *See* Ramey, D.W., 20:293
Malozewska-Bucko, B., *See* Kierzek, J., 20:1315
Malyshev, O.N., *See* Andreev, A.N., 20:2265
Mamedov, T.N., *See* Dem'yanov, A.V., 20:1555
Manakos, P., *See* Anlauf, H., 20:2113
Mancini, T.R., An overview: Component development for solar thermal systems, 20:708 (R;US)
Comparative evaluation of solar power generation options: A user's perspective, 20:667 (IA;IL)
Mandry, R., *See* Bedjidian, M., 20:2385
Manke, K.L., Characterization and monitoring of 300 Area Facility liquid waste streams: Status report, 20:305 (R;US)
Mankel, R., *See* Albrecht, H., 20:2144, 20:2146
Mann, L.J., *See* Liszewski, M.J., 20:451
Mann, R.C., *See* Rao, N.S.V., 20:2554
Mannel, T., *See* Anlauf, H., 20:2113
Mansker, L.D., *See* Pendergrass, R.A. II, 20:1423
Mansour, A., The physics of non-Newtonian liquid slurry atomization: Second quarterly technical report, April 1, 1994–June 31, 1994, 20:1493 (R;US)
Mansur, D.L., *See* Davis, G., 20:562
Manteuffel, T.A., Fast algorithms for transport models: Final report, 20:2278 (R;US)
Manzi, A., *See* Najera, E.A., 20:2465
Mao, N., The 12-GeV/c beam transfer and absorber lines for the Superconducting Super Collider, 20:1540 (R;US)
Marchand, L., *See* Carcreff, H., 20:741
Marek, J.M., Decommissioning of facilities at the Savannah River Site, 20:540 (R;US)
Margetis, S., Strange particle and antiproton production in S + nucleus collisions at 200 GeV/nucleon, 20:2269 (R;US)
Margolis, S.B., Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material, 20:1425 (R;US)
Marino, S.A., *See* Hall, E.J., 20:1913
Markes, B.M., *See* Johnson, A.R., 20:469
Markewitz, P., *See* Hake, J.F., 20:918
Markiewicz, M., *See* Hofmann, P., 20:1150, 20:1151
Marklund, G.T., *See* Lindqvist, P.A., 20:2426
Marks, N.A., Molecular dynamic study of compressive stress generation, 20:2354 (IA;AU)
See Guan, P., 20:2350
Marks, S., *See* Hoyer, E., 20:1591, 20:1605
See Humphries, D., 20:1604
Maroongroge, V., *See* Pope, G.A., 20:95
Marr, W.M., EAGLES 1.1: A microcomputer software package for analyzing fuel efficiency of electric and gasoline vehicles, 20:1072 (R;US)
Marr, W.W., Effects of battery technologies, driving patterns, and climate comfort control on the performance of electric vehicles, 20:1073 (R;US)
Marrero-Rivera, M., *See* Powell, G.L., 20:1338
Marschner, H., Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)
Marsh, J.D., Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:506 (R;US)
Martl, T., *See* Koebel, M., 20:1087
Martian, P., A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory, 20:259 (R;US)
Martin, A.D., Visible fluorescence of weathered lead, 20:1665 (R;US)
See Lerch, M.L.F., 20:2344
Martin, C., Ground state properties and glueball spectrum in SU(2) Yang-Mills theory using gauge invariant variables, 20:2093 (R;FR)
Martin, H.L., Unknown plant de-construction hazard – Toxic COS and CS_2 gas from torch cutting of pipe, 20:613 (R;US)
See Jantzen, C.M., 20:296
Martin, J.A., *See* Aumann, C.E., 20:1157
Martin, J.W., A study of transition metal implanted single crystal $YBa_2\ Cu_3\ O_{7-\delta}$, 20:1217 (IA;AU)
An elastic recoil time of flight spectrometer for material analysis, 20:1637 (IA;AU)
Martin, O.C., Partitioning of unstructured meshes for load balancing, 20:2542 (R;FR)
See Cerf, N., 20:1997
Martin, T.J., *See* Coulter, R.L., 20:717
Martin, W.A., *See* Tessmer, R.G. Jr., 20:1040
Martinez, M., *See* Igo-Kemenes, P., 20:2128
Martinez, R.L., *See* Johnson, C.S., 20:189
Martinez, V.A., In-place testing summary (1992): Progress report, 20:286 (R;US)
Martino, L., In situ analysis of soil at an open burning/open detonation disposal facility: J-Field, Aberdeen Proving Ground, Maryland, 20:1773 (R;US)
Martinsen, D., *See* Hake, J.F., 20:918
Martonak, R., Rotational melting in displacive quantum paraelectrics, 20:2361 (R;XA)
Martynyuk, L.I., *See* Matsakova, A.A., 20:1224, 20:1228
See Tikhonovskij, M.A., 20:1223
See Tortika, A.S., 20:1230
Maruyama, Tomoyuki, Collective flow and particle production in high energy heavy ion collisions, 20:2253 (RA;JP;In Japanese)
Maschke, A., Final report of the SSC electrodesorption studies, 20:1599 (R;US)
Masliah, M.R., *See* Kiebel, G.R., 20:1457
Masoud, M.M., Plasma rotation in coaxial discharges, 20:2399 (R;EG)

Viscosity effect on plasma sheath dynamic in plasma focus, 20:2400 (R;EG)
See Soliman, H.M., 20:2401
Mateeva, M., Methodology for evaluation of the reliability and safety of interim and final repositories for radioactive waste, 20:281 (I;BG)
Mathieu, D., *See* Penalva, J.M., 20:164
Mathiot, J.F., Hadronic physics with multi-GeV electrons, 20:2214 (R;FR)
See Merabet, H., 20:2162
Mathias, S.G., Training and qualification of nuclear power plant personnel in Brazil, 20:2467 (RA;XA)
Mathur, V.S., *See* Bedaque, P., 20:2157
Matis, H.S., Dilepton production from p-p to Ca-Ca at the Bevalac, 20:2178 (R;US)
Matkowsky, B.J., Studies in nonlinear problems of energy: Progress report, October 1, 1993–September 30, 1994, 20:1422 (R;US)
Matora, I.M., Existence domains and some properties of a particle bound state in fields with homogeneous dependence of its potential energy on coordinates, 20:2059 (R;XJ;In Russian)
Matsakova, A.A., Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites., 20:1228 (IA;UA;In Russian)
Superconducting, kinetic and structural properties of the quenched ceramic samples Bi, Pb-Sr-Ca-Cu-O, 20:1224 (IA;UA;In Russian)
See Tikhonovskij, M.A., 20:1223
See Tortika, A.S., 20:1230
Matschull, H.J., Canonical formulation of gravitation- and supergravitation theories, 20:2008 (R;DE;In German)
Matsuda, F., *See* Tsuda, K., 20:1249
Matsudaira, Y., *See* Obata, Y., 20:1930
Matsufuji, N., *See* Ishibashi, K., 20:2255
Matsumoto, H., *See* Miura, A., 20:1580
See Morita, S., 20:1581
Matsumoto, Hirofumi, *See* Satoh, Kazuyuki, 20:1582
Matsumoto, Hiroshi, *See* Suzuki, Kunio, 20:1574
Matta, M.K., High temperature high vacuum creep testing facilities, 20:1479 (R;EG)
Matthern, G., *See* Francis, C.W., 20:223
Matthes, F.C., *See* Buchert, M., 20:1760
Matthews, D.N., The effect of silver on the I-V characteristics of BSCCO silver-sheathed tapes, 20:1206 (IA;AU)
See Foley, C.P., 20:2378
Matthews, F., *See* Pastore, G., 20:1348
Maudlin, P.J., On the Taylor test, Part 3: A continuum mechanics code analysis of steady plastic wave propagation, 20:1154 (R;US)
Mausner, L.F., *See* Srivastava, S.C., 20:580
Mautner-Markhof, F., IAEA activities in nuclear power plant personnel training and qualification, 20:2490 (RA;XA)
Mavromatos, N.E., On black holes, space-time foam and the nature of time in string theory, 20:2061 (R;FR)
See Ellis, J., 20:2062
Mawdsley, Anne, Hall effect in Zn-doped Y-124, 20:1201 (IA;AU)
Max, N., Visualizing 3D velocity fields near contour surfaces: Revision 1, 20:2561 (R;US)
May, W., On the intra-seasonal variability within the extratropics in a general circulation model and observational data, 20:1729 (RA;US)
Mayancsik, B.A., Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Mayer, R., Input-output balances of acids, heavy metals and nutrients, and compartments of accumulation and depletion in forest ecosystems, 20:1812 (IA;DE)
Mayes, R., *See* James, G., 20:1445
Mayo, D., *See* Lisowski, P.W., 20:1587
Mayuzumi, M., *See* Saegusa, T., 20:199
Mbagwu, J.S.C., A multivariate analysis of intrinsic soil components influencing the mean-weight diameter of water-stable aggregates, 20:1798 (R;XA)
Physico-chemical and mineralogical properties influencing water-stability of aggregates of some Italian surface soils, 20:1797 (R;XA)
McAfee, J.M., Characterization of high-explosive initiation and safety at Los Alamos, 20:1687 (R;US)
McAfee, W.J., *See* Keeney, J.A., 20:810
McAlpine, N.S., *See* Li, D.G., 20:1189
See Sabet-Dariani, R., 20:1271
McArthur, D.A., *See* Bodette, D.E., 20:1506
See Lipinski, R.J., 20:1508
McBreen, J., *See* Adzic, G.D., 20:895
McCabe, D.E., Unirradiated material properties of Midland weld WF-70, 20:1161 (R;US)
McCabe, G.H., *See* Hagood, M.C., 20:1843
McCarthy, J.F., *See* Marsh, J.D., 20:506
McCarthy, K.A., A summary and assessment of oxidation driven volatility experiments at the INEL and their application to fusion reactor safety assessments, 20:2434 (R;US)
McClain, D.L., *See* Evaldi, R.D., 20:454
McClees, J., Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)
McConnell, B.W., *See* Barnes, P.R., 20:885
McConnell, K.I., Staff Technical Position on consideration of fault displacement hazards in geologic repository design, 20:292 (R;US)
McConnell, P., *See* Glass, R.E., 20:1119
McCormack, J.D., *See* Epstein, M., 20:329
McCormack, W.D., *See* Peters, B.B., 20:518, 20:519
McCormak, W.D., *See* Treat, R.L., 20:529
McCormick, L., *See* Zhao, X.K., 20:2311
McCoy, R.M., Load test of the 272E Building high bay roof deck and support structure, 20:523 (R;US)
Load test of the 3701D Building roof deck and support structure, 20:524 (R;US)
Load test of the 3790 Building Roof Deck and Support Structure, 20:525 (R;US)
McCrory, E., Optimizing the length of the stores and related effects, 20:1534 (R;US)
McCubbery, M.D., The influence of ion, electron and photon irradiation on the level of hydrogen at the interface of metal-semiconductor systems, 20:1277 (IA;AU)
McCune, J.M., *See* Kyoizumi, Seishi, 20:1933
McDaniel, A., *See* Bruck, R.I., 20:1817
McDonald, C.F., Helium turbomachine design for GT-MHR power plant, 20:770 (R;US)
McDonald, C.L., *See* Nguyen, D.T., 20:1104
McFarlane, N., *See* Koshyk, J.N., 20:1725
McGill, J., *See* Mao, N., 20:1540
McGill, K.E., *See* Nguyen, D.T., 20:1104
McGinn, C.W., *See* Miller, P.D., 20:499
See Watkins, D.R., 20:224
McGinnis, C.P., *See* Ramey, D.W., 20:293
McGowan, J.G., *See* Jennings, P., 20:88
McInroy, R., *See* Foy, B.R., 20:290
McIntosh, R.L., *See* Hertel, E.S. Jr., 20:1682
McIntyre, B.J., Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
McIntyre, G.J., *See* Olovsson, I., 20:2305
See Ptasiewicz-Bak, H., 20:2339
McKean, N.S., A high temporal resolution solid state thermal neutron detector, 20:1638 (IA;AU)
Mckenzie, D.R., *See* Guan, P., 20:2350
McKenzie, D.R., *See* Gerstner, E.G., 20:1256
See Hall, L.E., 20:1263
See Jenkins, B., 20:1185
See Khachan, J., 20:1253
See Marks, N.A., 20:2354
See Yin, Y., 20:1261
McKinley, I.G., Radioactive waste management, 20:283 (IA;PL)
McKinley, S.G., *See* King, A.G., 20:1333
McKinnon, B.A., Tight binding calculations of the surface electronic DOS of graphite, 20:2304 (IA;AU)
McLaren, J.M., Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II, 20:326 (R;US)
McLaughlin, J.C., *See* Besmann, T.M., 20:725
McLaughlin, S.B., Perennial grass production for biofuels: Soil conversion considerations, 20:630 (R;US)
McLaughlin, T.J., *See* Treat, R.L., 20:529
McLellan, G.W., *See* Richterich, L.R., 20:1496

McMahan, A.K., Generation and solution of effective many-body Hamiltonians for rare earth and transition metal compounds, 20:2387 (R;US)
McMichael, G.E., *See* Zhou, X.L., 20:1871
McMillan, K., *See* Oliver, C.E., 20:1427
McNeece, S.G., Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
McPherson, A., *See* Rhodes, C.K., 20:2279
McWilliams, J.C., *See* Bush, A.B.G., 20:1716
Meacham, J.E., *See* Epstein, M., 20:329
See Pulsipher, B.A., 20:310
See Rebagay, T.V., 20:420
Medernach, J.W., *See* Lee, S.R., 20:1673
Meesmann, H., The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Meichle, R.H., Safety assessment of discharge chute isolation barrier preparation and installation: Revision 1, 20:526 (R;US)
Meinecke, W., Comparative assessment of the technical performance of solar thermal concentrating technologies for power generation, 20:668 (IA;IL)
See Kleib, H., 20:661
Meinhold, R., *See* Williams, G.V.M., 20:2377
Meischen, S.J., Nitrogen accumulation profiles of selected grain and vegetable crops: A bibliography (1940-1992), 20:1870 (R;US)
Meissner, T., *See* Chan, C.T., 20:2081
Meitzler, W.D., *See* Jou, Jiing-Yih J., 20:970
Mejane, A., *See* Carvallo, G., 20:780
Mekhail, F.M., Electronic spectra of plutonium ions in nitric acid and in lithium nitrate solutions, 20:1409 (R;EG)
Investigation of the oxidation of hydrochloric acid in scrubbing solutions containing hydrogen peroxide, 20:160 (R;EG)
Mele, B., *See* Baillargeon, M., 20:2102
Melezhik, V.S., Vacuum polarization effects in low-energy muonic atom collisions, 20:2289 (R;XJ)
Meltzer, M., Pollution prevention: Avoiding the need to manage wastes, 20:1053 (R;US)
Menager, M.T., *See* Menet-Dressayre, C., 20:1774
Mendez-Galain, R., *See* Merabet, H., 20:2162
Menegus, R.L., [Dispersion of fission products], 20:742 (R;US)
See Brinn, M.S., 20:872
Menet-Dressayre, C., Elementary migration around the Oklo nuclear reactors. Implications for high level radioactive wastes storage, 20:1774 (R;FR;In French)
Menovsky, A.A., *See* Li, J.N., 20:2379
Mensink, D.L., Preconceptual engineering design for the APT ^{3}He Target/Blanket concept, 20:1693 (R;US)
Merabet, H., Inelastic leptoproduction of J/ψ, 20:2162 (R;FR)
Merbl, A., *See* Kenan, G., 20:660
Mercer, K., *See* Krzyminiewski, R., 20:1385
Mercer, R.B., *See* Lindsey, K.A., 20:340
Mernagh, T.P., *See* Long, G.M., 20:2336
Meron, G., *See* Weiner, D., 20:680
Merrill, B.J., Assessment of CONTAIN and MELCOR for performing LOCA and LOVA analyses in ITER, 20:2437 (R;US)
See Gaeta, M.J., 20:2435
Mertig, R., *See* Beenakker, W., 20:2111
Meschter, P.J., *See* Corman, G.S., 20:1063
Meshkova, O.V., *See* Dejneka, T.G., 20:1225
Mesmer, R.E., *See* Moore, R.C., 20:1367
Messaoudi, M., *See* Nimal, J.C., 20:188
Metzler, D., Groundwater remediation at UMTRA Sites, 20:485 (RA;US)
Meyer, F.W., Angular and charge state distributions of highly charged ions scattered during low energy surface-channeling interactions with Au(110), 20:2347 (R;US)
Meyer, R.H., Tonopah Test Range EGS graphics tracking display system: HP370, 20:1697 (R;US)
Meyer, T.J., Excited state processes in transition metal complexes. Redox splitting in soluble polymers: Progress report, July 15, 1993–July 14, 1994, 20:1374 (R;US)
Meyers, E.S., *See* Ramey, D.W., 20:293
Meyers, H.M. III, *See* Powell, G.L., 20:1338
Meyers, S., *See* Sheinbaum, C., 20:1032
Meziani, Z.E., Nuclear research with the electromagnetic probe: Final progress report, 20:2190 (R;US)
Michaelis, M.M., *See* Phipps, C.R., 20:1441, 20:1971
Michael, M.L., *See* Bishay, S.T., 20:840
Michalewicz, M.T., Massively parallel studies of the electronic structure of disordered micro-crystallites of transition metal oxides, 20:1210 (IA;AU)
Michalik, J., Radiation - induced silver agglomeration in A zeolites, 20:1382 (IA;PL)
Silver-centred radicals in A zeolites, 20:1398 (IA;PL)
See Burlinska, G., 20:1394, 20:1399
See Lukasiewicz, A., 20:1361
See Stachowicz, W., 20:1395, 20:1396, 20:1402
Michel, J., Design and implementation of an integrated architecture for massive parallel data treatment of analogue signals supplied by silicon detectors of very high spatial resolution, 20:2539 (R;FR;In French)
Michie, R., *See* Bodette, D.E., 20:1506
Michiels, H., Survey of programme and experience on training and qualification for nuclear power plant personnel in Belgium, 20:2466 (RA;XA)
Michizono, Shinichiro, Performance of the 46MW klystron for KEK B-factory, 20:1567 (RA;JP;In Japanese)
See Hanaki, Hirofumi, 20:1575
See Honma, Hiroyuki, 20:1572
Miehe, Ch., *See* Bernas, M., 20:2251
See Czajkowski, S., 20:2246
Mielke, E.W., *See* Ne'eman, Y., 20:2033
Mieville, R.L., *See* Balachandran, U., 20:134
Mikhail, I.F.I., *See* Bishay, S.T., 20:840
Mikhailov, P.V., *See* Mosevitskij, I.S., 20:782
Mikhailtsina, O.V., *See* Grigoryev, E.I., 20:1389
Miknis, F.P., *See* Netzel, D.A., 20:3
Milanov, M., Principles and criteria for creation of a concept for national radwaste repository, 20:277 (I;BG)
Milanovich, F.P., Fiber-optic sensors for rapid, inexpensive characterization of soil and ground water contamination, 20:1839 (R;US)
Miles, P.A., Anomalous time-decay in neutron depolarization by high-Tc superconductors, 20:2375 (IA;AU)
Miles, S., Astatination of monoclonal antibodies, 20:1889 (R;XJ;In Russian)
Milewski, J., *See* Lewis, G.K., 20:1155
Milintawisamai, M., *See* Panyatipsakul, Y., 20:1312
See Polphong, P., 20:1851
Miljevic, N.R., *See* Chmielewski, A.G., 20:1320
Millar, J.J., *See* Lee, G.N., 20:2303
Miller, B.G., *See* Jennings, P., 20:88
Miller, C., *See* Bellman, R., 20:928
Miller, D.J., Deep inelastic e-γscattering, with beamsstrahlung, 20:1619 (RA;DE)
New feature in the magnetoresistance of silicon, 20:1269 (IA;AU)
States above a quantum well in tilted magnetic fields, 20:2368 (IA;AU)
See Goretta, K.C., 20:1168
See Xiong, Z., 20:2326
Miller, D.P., Top ten list of user-hostile interface design, 20:2558 (R;US)
Miller, D.R., A Sandia National Laboratories decontamination and demolition success story, 20:514 (R;US)
Miller, G., *See* Clow, J., 20:502
Miller, G.L., 95-1 Campaign evaporator boildown results, 20:382 (R;US)
Miller, J.D., Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fourteenth quarterly report, 14 November 1993–13 February 1994, 20:1 (R;US)
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fifteenth quarterly report, 14 February 1994–13 May 1994, 20:2 (R;US)
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Sixteenth quarterly report, 14 May–13 August 1994, 20:1297 (R;US)
Miller, J.T., Abbreviations, acronyms, and initialisms frequently used by Martin Marietta Energy Systems, Inc.: Second edition, 20:2569 (R;US)

Miller, M.K., *See* Godfrey, R.D., 20:1488
Miller, P.D., Defining the role of risk assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation process at the DOE-OR, 20:499 (R;US)
Miller, R.J.D., Ultrafast optical studies of surface reaction processes at semiconductor interfaces: Progress report, 20:682 (R;US)
Miller, W.O., *See* Woloshun, K., 20:1649
Mills, K.J., *See* Emerson, D.W., 20:145
Milot, J.F., Hydrodynamic operation analysis of a pulse with disks and rings column, 20:1298 (R;FR;In French)
Minagawa, Masao, Aspect of human food ecology: Development of carbon and nitrogen isotope method, 20:1303 (IA;JP;In Japanese)
Minamihara, Y., *See* Hoyer, E., 20:1605
Minarick, J.W., *See* Vanden Heuvel, L.N., 20:875, 20:876
Minault, S., *See* Penalva, J.M., 20:164
Minford, E., *See* Damle, A.S., 20:17
Minkevich, A.V., Homogeneous anisotropic cosmological models in the minimum quadratic Poincare gauge theory of gravity, 20:2046 (R;XA)
Mioduski, T., Covalency of scandium(III) as manifested in the enthalpies of solution of anhydrous rare earth halides, 20:1359 (IA;PL)
Determination of hydrate numbers from solubility data, 20:1358 (IA;PL)
Miquel, R., *See* Igo-Kemenes, P., 20:2128
Miracle, M., *See* Tingle, A.R., 20:1821
Mironov, V.A., *See* Litvak, A.G., 20:1983
Mirowicz, J., Industrial gauge of sulphuric acid concentration, 20:603 (IA;PL)
Mishra, N.C., Large scale solubilization of coal and bioconversion to utilizable energy: Technical progress report, July 1, 1994–September 30, 1994, fourth quarterly, 20:41 (R;US)
Misra, M., Novel microorganism for selective separation of coal from ash and pyrite: Third quarterly technical progress report, March 1, 1994–May 31, 1994, 20:40 (R;US)
Mitchell, J.T., Stopping and two-pion Bose-Einstein correlation results from CERN experiment NA35, 20:2270 (R;US)
Mitchell, M.A., *See* Gobby, P.L., 20:2442
Mitchell, R.D., Solution structure analysis of the conformational changes that occur upon the binding of the protein kinase inhibitor peptide to the catalytic subunit of the cAMP dependent protein kinase, 20:1869 (R;US)
Mitchell, T.P., Fluctuations in the large-scale atmospheric circulation and ocean conditions associated with the dominant modes of wintertime precipitation variability for the contiguous United States, 20:1730 (RA;US)
Mitsyn, G.V., *See* Abazov, V.M., 20:1888
Miura, A., Development of an S-band RF window for linear colliders, 20:1580 (RA;JP;In Japanese)
See Morita, S., 20:1581
Miura, Atsushi, *See* Suzuki, Kunio, 20:1574
Miura, Sadatoshi, Application of X-ray radiography to archaeology, 20:581 (IA;JP;In Japanese)
Miyakawa, K., *See* Emerson, D.W., 20:145
Miyamoto, Y., *See* Takada, S., 20:786
Miyano, K., *See* Miyata, H., 20:2170
Miyata, H., Inclusive K_s^0 production in two photon processes, 20:2170 (RA;JP)
Miyauchi, Yasuyuki, *See* Morii, Yasutsugu, 20:1565
Mizuno, H., *See* Odagiri, J., 20:1570
Mobley, C., Improved die castings through plasma surface modification, improved sensors and die soldering prevention: Quarterly progress report 1, July 1–September 30, 1994, 20:1112 (R;US)
Mobley, J.R., *See* Kupfer, M.J., 20:528
Moeller, P., Mass model for unstable nuclei, 20:2219 (RA;JP)
Moeller, W., Forschungszentrum Rossendorf, Institut fuer Ionenstrahlphysik und Materialforschung. Annual report 1993, 20:2313 (R;DE)
Moeslang, A., *See* Borgstedt, H.U., 20:1113
Moglievsky, L.Yu., *See* Ciesla, K., 20:1486
Moglivanskij, D.N., *See* Topchiashvili, M.I., 20:1279
Mohamed, F.A., *See* Omar, A.A., 20:2531
Mohammed, F.A., Authorization and licensing of nuclear research reactor operating personnel, 20:578 (IA;EG)
Highly reliable computer network for real time system, 20:821 (R;EG)
Mohar, M.F., *See* Piechaczek, A., 20:2227
Mohnen, V.A., Temporal development of the pollution load of reactive trace gases in forested areas in the United States, 20:1757 (IA;DE)
Moinester, M.A., *See* Akhundov, A.A., 20:2160
Mojtahedi, W., *See* Ghazanfari, R., 20:7
Molburg, J.C., *See* Doctor, R.D., 20:59
Moll, A.J., Characterization of inactive carbon in GaAs, 20:1284 (R;US)
Molokanov, A.G., *See* Abazov, V.M., 20:1888
Moloney, G.R., *See* Laird, J.S., 20:2327
Moltz, D.M., A storage ring for radioactive beams, 20:1606 (R;US)
Money, E., *See* Ediriweera, R.N., 20:1267
Mong, G., *See* Campbell, J.A., 20:302
Monks, J.I., Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL, 20:493 (R;US)
Montgomery, J.C., Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers, 20:639 (R;US)
See Haynes, J.M., 20:838
Montgomery, M.H., *See* Berry, J.T., 20:1052
Montmain, J., The qualitative and fuzzy contributions for industrial process diagnostic. Application in the DIAPASON project, 20:163 (R;FR;In French)
Moore, G.W.K., *See* MacKay, M.D., 20:1728
Moore, J.E., *See* Gobby, P.L., 20:2442
Moore, N.L., *See* Hughes, K.R., 20:931
Moore, O.E., *See* Edwards, R.E., 20:1036
Moore, R.C., A visual cell for measuring the solubility of prograde soluble salts in water at high temperatures and pressures, 20:1367 (R;US)
Moore, T.D., Comparison of methods for developing contaminant-particle size distributions for suspended sediment, 20:227 (R;US)
Moore, T.L., 241-SY-101 air lance removal lessons learned, 20:531 (R;US)
Morand, R., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Morel, D.L., Advanced processing technology for high-efficiency, thin-film $CuInSe_2$ and CdTe solar cells: Annual subcontract report, 1 March 1993–28 February 1994, 20:687 (R;US)
Moreno, C.V., Current situation of spent fuel management in the Laguna Verde Nuclear Power Plant, Veracruz, Mexico, 20:202 (RA;XA)
Moreno, J.B., *See* Andraka, C.E., 20:707
Morgan, C.D., Increased oil production and reserves from improved completion techniques in the Bluebell Field, Uinta Basin, Utah, 20:97 (R;US)
Morgan, M.J., *See* Jinks, D., 20:2337
Morgan, N., *See* Carter, S., 20:140
Mori, Michio, Roles of gap junctions and tight junctions in the development of liver cancer and metastatic tumors, 20:1934 (RA;JP;In Japanese)
Mori, Yukihide, *See* Fuketa, Toyoshi, 20:817
Moriguchi, Y., Atomic energy policy of Japan, especially plutonium utilization policy, 20:953 (I;XA)
Morii, Yasutsugu, RF system of FELI linac, 20:1565 (RA;JP;In Japanese)
Morita, A., *See* Obata, Y., 20:1930
Morita, S., Development of the S-band high power RF load. 3, 20:1581 (RA;JP;In Japanese)
Morozumi, Y., *See* Kageyama, T., 20:1564
Morris, J., *See* Oswald, R., 20:686
Morris, M.D., *See* Gwo, J.P., 20:295
Morrison, J.A., Low-level waste certification plan for the WSCF Laboratory Complex, 20:335 (R;US)
Low-level waste characterization plan for the WSCF Laboratory Complex, 20:336 (R;US)

Quality assurance program plan for low-level waste at the WSCF Laboratory, 20:337 (R;US)
Morsch, H.P., *See* Rousteau, S., 20:2161
Morse, D.H., *See* Roberts, M.L., 20:1336
Mortenson, L.E., *See* Peck, H.D. Jr., 20:1846
Morthorst, P.E., ELSE - a model for forecasting electricity demand in the service sector: En prognosemodel for servicesektorens elforbrug, 20:995 (R;DK;In Danish)
Mortimore, J.A., Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:461 (R;US)
Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:462 (R;US)
Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:463 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:464 (R;US)
Mosevitskij, I.S., Analysis of afterheat removal from modular HT-GRs during accidents, and a concept for use of spherical fuel elements in LWRs, 20:782 (RA;XA)
Mosleh, A., Proceedings of workshop I in advanced topics in risk and reliability analysis: Model uncertainty: Its characterization and quantification, 20:874 (R;US)
Mosnier, A., *See* Fouaidy, M., 20:1554
Moss, T.A., *See* Andraka, C.E., 20:707
Mosso, S.J., *See* Rider, W.J., 20:1476
Mott, L., *See* Flowers, L., 20:1001
Mottershead, C.T., *See* Yuan, V.W., 20:1588
Moulin, D.J., Dynamic compensation of the silver self-powered neutron detector in the ramp program at Osiris reactor, 20:824 (R;FR)
Moulin, H., Study and characterization of semi-conductor materials III-V for their applications to the ionizing radiation detection, 20:1627 (R;FR;In French)
Mourad, J., The two-fermion relativistic wave equations of Constraint Theory in the Pauli-Schroedinger form, 20:2053 (R;FR)
Moussaliam, B., *See* Knecht, M., 20:2166
Moynot, M., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Mudd, M.J., *See* Dennis, R.A., 20:18
Muehlbauer, W., Utilization of solar energy for energy autonomous climatisation and irrigation of greenhouses in hot arid zones: Final report, 20:1045 (I;DE;In German)
Muehle, H., *See* Maass, K., 20:1079
Mueller, A.C., On the capabilities of present radioactive beam facilities, 20:1520 (R;FR)
Mueller, H., Development of an optics-based method for reducing mine-stone content of run-of-mine coal: Final report, 20:72 (I;DE;In German)
Mueller, K.H., *See* Watson, S.A., 20:1651
See Wenhausen, P.A.P., 20:1121
Muenchausen, R.E., *See* Pluym, T.C., 20:1238
Muir Wood, R., *See* Maddock, R.H., 20:1836
Mujibur Rahman, S.M., *See* Osman, S.M., 20:1347
Mukerjee, S., *See* Adzic, G.D., 20:895
Mukherji, S., *See* Das, S.R., 20:2043
See Mahapatra, S., 20:2037
Mukhopadhyaya, B., *See* Adhikari, R., 20:2159
Mukovozov, I.E., *See* Oliva, C., 20:1351
Mulkey, C.H., *See* Basra, T.S., 20:401
Mullally, J.A., Low level tank waste disposal study, 20:368 (R;US)
Mullaney, J.E., MBA acceptance test procedures, software Version 1.4, 20:566 (R;US)
See Russell, V.K., 20:565
Mullens, J.A., *See* Wood, R.T., 20:806
Muller, K.H., Current-carrying length scale in silver sheathed Bi-Pb-Sr-Ca-Cu-O tapes, 20:2382 (IA;AU)
Flux jumps in magnetization loops of melt-textured Y-Ba-Cu-O, 20:1200 (IA;AU)
See Foley, C.P., 20:2378
See Matthews, D.N., 20:1206
Mullin, S.A., A Hypervelocity Experimental Research Database (HERD): Support for the Wright Laboratory Armament Directorate Code Validation Program (COVAL), 20:1698 (R;US)
Munroe, P.R., *See* Xia, J.A., 20:1194
Murach, D., Natural and anthropogenic stress in spruce and beech ecosystems in the Solling project, 20:1808 (IA;DE)
Muradian, R., Flare stars and Pascal distribution, 20:2013 (R;XA)
Regge in the sky: Origin of the cosmic rotation, 20:1982 (R;XA)
Murakami, M., *See* Taylor, G., 20:2422
Murakami, Shigeru, *See* Arigane, Kenji, 20:862
Murao, Yoshio, *See* Akimoto, Hajime, 20:765
Murphy, C.E. Jr., Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G, 20:543 (R;US)
Musgrave, B., *See* Derrick, M., 20:2145
Musolf, M.J., *See* Haxton, W.C., 20:2080
Muto, Masahiro, Analysis of the clonality of prelymphoma cells and approach to the study of initial events on radiation-induced lymphomagenesis, 20:1937 (RA;JP;In Japanese)
Muzychka, Yu.A., *See* Andreev, A.N., 20:2265
Myer, L.R., *See* Wang, H.F., 20:1495
Myers, B.L., *See* Martin, H.L., 20:613
Myers, J., Automated boiler combustion controls for emission reduction and efficiency improvement: Quarterly progress report, February 14, 1994–May 14, 1994, 20:91 (R;US)
Mysak, L.A., *See* Peng, S., 20:1731

N

Nachtigal, N.M., *See* Freund, R.W., 20:2551, 20:2552, 20:2553
Nader, W., The use of flow zytometry for microbiological analysis and assessing the performance of aerobic and anaerobic sewage works with the aim of biological process optimisation and control: Final report, 20:621 (R;DE;In German)
Nagai, Akio, *See* Morii, Yasutsugu, 20:1565
Nagano, K., *See* Saegusa, T., 20:199
Nagano, T., *See* Isobe, H., 20:1803
Nagata, M., Study of diesel cycle with a new condition of restricting a cycle and the best values, 20:1069 (IA;JP;In Japanese)
Nagatsuka, Kenji, *See* Satoh, Kazuyuki, 20:1582
Nagy, M.E., Development of nuclear education, 20:2573 (IA;EG)
Nahory, R.E., *See* Sturge, M.D., 20:1246
Najera, E.A., National programme and experience on training and qualification for nuclear plant personnel, 20:2465 (RA;XA)
Nakamoto, T., *See* Ishibashi, K., 20:2255
Nakamura, N., *See* Zhao, Y., 20:1260
Nakamura, Nori, *See* Ito, Takashi, 20:1931
Nakamura, Toshio, New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry, 20:1304 (IA;JP;In Japanese)
Nakanishi, K., *See* Rozhkov, M., 20:1973
Nakao, Katsumi, *See* Honma, Hiroyuki, 20:1572
Nakao, Katumi, *See* Michizono, Shinichiro, 20:1567
Nakashima, Eiji, *See* Ohtaki, Kazuo, 20:1943
Nakashima, S., *See* Isobe, H., 20:1803
Nakos, J.T., Research on U.S. nuclear power plant major equipment aging, 20:883 (R;US)
Namazian, M., *See* Schefer, R.W., 20:1426
Namikawa, Reiko, *See* Kyoizumi, Seishi, 20:1933
Nance, W.R., Characteristics and development report for the MC3994 and MC3994A relays, 20:1504 (R;US)
Nanopoulos, D.V., *See* Ellis, J., 20:2062
Nanstad, R.K., *See* McCabe, D.E., 20:1161
Nanthakumar, J., Integrated operation of hydro thermal system, 20:636 (I;LK)
Nara, Yasushi, Pauli blocking and internucleus potential effects on total reaction cross section, 20:2256 (RA;JP;In Japanese)
Narath, A., US House of Representatives Committee on Energy and Commerce Subcommittee on Energy and Power, 20:934 (R;US)
Narbutt, J., Liquid-liquid partition and hydration of some bis and tris-β-diketonates, 20:1318 (IA;PL)
Narusawa, K., *See* Yanagihara, S., 20:1071
Naser, J.A., *See* Wood, R.T., 20:806

Nash, C.R., *See* Lamberd, D.L., 20:360
Nassar, S.F., *See* Bishay, S.T., 20:840
Nastasi, M., *See* Yu, N., 20:1237
Nasunjilegal, B., *See* Li, Hongshuo, 20:1131
Nath, C., German-Chinese cooperation in the field of wind and solar energy: Final report, 20:721 (I;DE;In German)
Natkaniec, I., *See* Pawlukojc, A., 20:2340
Nau, A., *See* Albrecht, H., 20:2144, 20:2146
Nava, P., Assessment of performance and economics of parabolic trough solar electric systems for selected Mediterranean countries, 20:669 (IA;IL)
Nazarov, V.N., *See* Wronski, W., 20:1662
Ne'eman, Y., The generalized Erlangen program and setting a geometry for four- dimensional conformal fields, 20:2033 (R;US)
Neal, D.R., *See* Bodette, D.E., 20:1506
Neau, E.L., New developments in high average power short-pulse induction accelerators for industrial and environmental applications, 20:1525 (R;US)
Nechkin, A.A., *See* Belyaev, S.N., 20:2264
Nedelko, S.N., *See* Burdanov, Ya.V., 20:2095, 20:2096
Negron, S.B., Analysis of criticality alarm system response to an accidental criticality outside the cascade process buildings at the Portsmouth Gaseous Diffusion Plant, 20:151 (R;US)
Neill, J.S., *See* Brinn, M.S., 20:872
Neilson, D., *See* Szymanski, J., 20:2367
See Thakur, J.S., 20:1129
Nelson, J.L., *See* Anantatmula, R.P., 20:323
Nelson, R., History of US uranium mining and milling, 20:940 (RA;US)
Nelson, R.A., Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Nemanich, R.J., *See* Sayers, D.E., 20:2312
Nemec, R., *See* Lewis, G.K., 20:1155
Nemoto, Kumie, *See* Yoshida, Kazuko, 20:1940
Nersessian, A., "Charge-Dyon" system as the reduced oscillator, 20:1979 (R;XA)
Nesterov, A.V., *See* Filippov, G.F., 20:2217
Nesterov, S.V., *See* Grigoryev, E.I., 20:1389
Netzel, D.A., An investigation of the role of water on retrograde/condensation reactions and enhanced liquefaction yields: Quarterly progress report, July 1, 1994–September 30, 1994, 20:3 (R;US)
The use of solid-state NMR techniques for the analyses of water in coal and the effect of different coal drying techniques on the structure and reactivity of coal: Quarterly report, June 1, 1994–August 31, 1994, 20:35 (R;US)
Neubauer, M., High-power RF window design for the PEP-II B Factory, 20:1614 (R;US)
Neubeck, R., *See* Jangland, L., 20:1944
Neuman, S.P., *See* Bassett, R.L., 20:1824
Neves, B.B.B., *See* Fuck, R.A., 20:1301
Newby, R.A., Integrated low emissions cleanup system for direct coal fueled turbines: Twenty-sixth quarterly report: Quarterly status for the period January–March 1994, 20:9 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines (moving bed, fluid bed contactor/ceramic filter): Twenty-seventh quarterly status report, April–June 1994, 20:10 (R;US)
Ng, C., *See* Neubauer, M., 20:1614
See Pendleton, R., 20:1613
Ng, King-Yuen, Derivation of coupling impedance from the wake potential of a finite bunch, 20:1533 (R;US)
Emittance growth due to negative-mass instability above transition, 20:1532 (R;US)
Nguyen Hong Chuong, *See* Minkevich, A.V., 20:2046
Nguyen Trung Dan, Optical instabilities and chaos due to the virtual formation of biexcitons, 20:2301 (R;XA)
Nguyen Van Hoang, *See* Minkevich, A.V., 20:2046
Nguyen, D.T., An update of corrosion inhibitors for mild steel exposed to 32-0-0 UAN solution, 20:1105 (R;US)
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)
Static corrosion of construction materials exposed to superphosphoric acid made from various sources of phosphate rock, 20:1104 (R;US)
Nguyen, H., *See* Crane, J.K., 20:1510
Nguyen, T., *See* Bett, A., 20:683
Nguyen, T.T., *See* Roblin, P., 20:148
Nicholls, A., *See* LaMontagne, J., 20:1013
Nichols, D.E., *See* Nguyen, D.T., 20:1105
Nick Savvides, Growth and surface microstructure of epitaxial $YBa_2Cu_3O_{7-x}$ thin films, 20:1252 (IA;AU)
Nickel, H., *See* Hahne, M., 20:1236
Nickelson, D.F., *See* Raivo, B.D., 20:263
Nicolaev, Y., *See* Hoth, C.W,, 20:791
Nicolescu, B., *See* Gauron, P., 20:2165
Niehaus, F., Environmental and health effects of various energy systems, 20:943 (I;XA)
Environmental and health effects of various energy systems, 20:958 (I;XA)
Nielsen, A., *See* Rasch, L., 20:1017
Nielsen, J., *See* Madsen, G., 20:979
Niessen, H.F., SANA experiments related to self-operating removal of decay heat, 20:787 (RA;XA)
Niksa, S., *See* Yu, Liya, 20:55
Nilsson, Ulf, Quantitative in vivo elemental analysis using X-ray fluorescence and scattering techniques. Applications to cadmium, lead and bone mineral, 20:1891 (R;SE)
Nimal, J.C., Extension of Fakir, Kahina, a computer code of kinsfolk actinides heat irradiation neutron and activity, 20:188 (R;FR)
See Bresard, I., 20:221
See Eid, M., 20:769
See Lee, Y.K., 20:814
Ninham, B.W., *See* Chambell, S.J., 20:1178
See Onyszkiewicz, I., 20:1180
See Puclin, T., 20:1214
Niomura, Nagao, *See* Asano, Ryoji, 20:1248
Nishikawa, Tomoyuki, On limitations and improvements of klystron design code 'JPNDISK', 20:1569 (RA;JP;In Japanese)
Nishioka, Masaharu, Investigation of coal structure: Final report, 20:54 (R;US)
Nissilae, M., Periodic testing of safety valves of nuclear facilities: Bases, procedures and requirements, 20:1450 (R;FI;In Finnish)
Nitao, J.J., *See* Buscheck, T.A., 20:320
Nix, J.R., *See* Moeller, P., 20:2219
Noda, Akira, *See* Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Noda, Shoji, Ion beam technology for nanostructure and interface engineering, 20:2348 (IA;JP;In Japanese)
Noda, Yuko, *See* Otsu, Hiroshi, 20:1925
Noel, B., Reflux condenser mode with non-condensible gas: assessment of Cathare against Bethsy test 7.2C, 20:759 (R;FR)
See Dumont, D., 20:758
Noergaard, R., *See* Morthorst, P.E., 20:995
Noid, D.W., *See* Getino, C., 20:2280
Nomura, Taisei, Radiation and offspring cancer, 20:1928 (RA;JP;In Japanese)
Nonaka, Toshihiko, *See* Kon, Tadashi, 20:2173
Nordlinder, S., *See* Bergstroem, U., 20:1859
Norman, P., The bond structure of closed shells in condensed nuclear matter, 20:2208 (IA;AU)
Norseev, Yu.V., *See* Miles, S., 20:1889
Northcutt, W.G. Jr., Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)
Norton, G.A., *See* Buttermore, W.H., 20:71
Nourse, B.D., *See* Watkins, D.R., 20:224
Nouson, P.A., Security Transition Program Office; progress report, 20:548 (R;US)
Novaes, S.F., *See* Eboli, O.J.P., 20:2105
Novak, C.F., Thermodynamic modeling of neptunium(V) solubility in concentrated $Na\text{-}CO_3\text{-}HCO_3\text{-}Cl\text{-}ClO_4\text{-}H\text{-}OH\text{-}H_2O$ systems, 20:315 (R;US)

Novgrod, R.L., *See* Benbennick, M.E., 20:567
Nowak, S., *See* Albrecht, H., 20:2144, 20:2146
Nowicki, A., A facility with induction furnace for boron nitride production, 20:1360 (IA;PL)
See Rowinska, L., 20:597
Nowlen, S.P., An evaluation of the fire barrier system thermo-lag 330-1, 20:812 (R;US)
Nozaki, T., *See* Miyata, H., 20:2170
Nugent, K., *See* Gurarie, V., 20:1216
Nugent, K.W., *See* Dooley, S.P., 20:2355
See Weiser, P.S., 20:1257
Nutt, A.W., *See* Martin, H.L., 20:613
Nuttall, G.L., *See* DiCenso, A.T., 20:394
Nuttall, H.E., *See* Reimus, P.W., 20:288
Nyberg, G.L., *See* McCubbery, M.D., 20:1277

O

O'Brien, P., *See* Ishii, M., 20:881
O'Conner, W.K., *See* Oden, L.L., 20:265
O'Connor, D.J., *See* Zhang, F.M., 20:1126
O'Connor, W.K., *See* Oden, L.L., 20:264
See Soelberg, N.R., 20:268
O'Donnell, J.J., *See* Campbell, W.M., 20:6
O'Gallagher, J.J., Evaluation of performance and cost trade-off in the optimization of solar dish electric system, 20:670 (IA;IL)
O'Hara, J.M., Human factors engineering guidance for the review of advanced alarm systems, 20:830 (R;US)
See Brown, W.S., 20:831
O'Rourke, P.E., *See* Prather, W.S., 20:1672
Oates, L., *See* Short, S.M., 20:511
Obata, Y., TL transgenic mouse strains, 20:1930 (RA;JP;In Japanese)
Obertopp, T., Control of the collector outlet temperature at the solar test plant TESOP: Structural approximation of the point-to-point transmission function. Final report, 20:703 (I;DE;In German)
Control of the collector outlet temperature at a solar collector test stand: Study, 20:705 (I;DE;In German)
Oblow, E.M., *See* Rao, N.S.V., 20:2554
Ocampo, V.P., *See* Lamberd, D.L., 20:360
Ocko, B.M., Surface x-ray scattering and scanning tunneling microscopy studies at the Au(111) electrode, 20:2309 (R;US)
Odagiri, J., Development of X-band high power pulsed klystrons, 20:1570 (RA;JP;In Japanese)
Oden, L.L., Baseline tests for arc melter vitrification of INEL buried wastes: Volume 1: Facility description and summary data report, 20:264 (R;US)
Baseline tests for arc melter vitrification of INEL buried wastes: Volume II: Baseline test data appendices, 20:265 (R;US)
See Soelberg, N.R., 20:268
Oestgaard, E., *See* Engvik, L., 20:2223
Oestling, M., *See* Walker, S.R., 20:2330
Oganessian, Yu.Ts., *See* Rotbard, G., 20:2244
Ogawa, Toru, *See* Yamagishi, Shigeru, 20:818
Oglesby, R.J., *See* Lupo, A.R., 20:1726
Oguri, Yoshiyuki, Particle optics in the TIT-RFQ calculated using a 3D particle-in-cell code, 20:1537 (RA;JP;In Japanese)
See Takeda, Osamu, 20:1559
See Wu Guanglu, 20:1536
Oh, S.K., *See* Kim, B.R., 20:2189
Ohashi, Masao, *See* Fukazawa, Akio, 20:1438
Ohl, K.E., Measurement of the polarization in the decay $B^0 \rightarrow J/\psi K^{*0}$ in $p\bar{p}$ collisions at $\sqrt{s} = 1.8$ TeV, 20:2150 (R;US)
Ohnishi, Akira, *See* Nara, Yasushi, 20:2256
Ohnuki, Akira, *See* Akimoto, Hajime, 20:765
Ohnuki, T., *See* Isobe, H., 20:1803
Ohshika, Junji, *See* Yamaguchi, Seiya, 20:1577
Ohsono, Katsunari, *See* Fukazawa, Akio, 20:1438
Ohtaki, Kazuo, G-banding analysis of radiation-induced chromosome damage in lymphocytes of Hiroshima atomic-bomb survivors, 20:1943 (R;JP)
Ohtomo, Akitoshi, *See* Arigane, Kenji, 20:862
Ohya, Akio, Measurement technique of radwaste content: For TRU, 20:555 (IA;JP;In Japanese)
Ohya, Keiji, *See* Sakamoto, Mitsunori, 20:1566
Ohyama, Hiroshi, $D^{*\pm}$ production in two-photon process, 20:2171 (RA;JP)
Oitmaa, J., A series of quantum spin models on 3-dimensional lattices, 20:2391 (IA;AU)
Okada, M., *See* Yanagihara, S., 20:1071
Okamoto, Hiromi, *See* Dewa, Hideki, 20:1560
See Shirai, Toshiyuki, 20:1556
Okamoto, Tadashi, *See* Sakamoto, Mitsunori, 20:1566
Okamura, Masahiro, *See* Oguri, Yoshiyuki, 20:1537
See Takeda, Osamu, 20:1559
Okazaki, T., *See* Kostyuk, A., 20:2054
Okko, O., VTT test borehole for bedrock investigations, 20:1841 (R;FI)
Okkonen, T., A synthesis of hydrogen behaviour in severe reactor accidents, 20:766 (R;FI)
Okovit, V.S., Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Temperature dependence of displacement module and internal friction in Ga As monocrystals., 20:1142 (IA;UA;In Russian)
Olah, G.A., *See* Mitchell, R.D., 20:1869
Olander, A.R., 300 Area treated effluent disposal facility operating specifications document, 20:1860 (R;US)
Olchevski, A., *See* Bardin, D., 20:2112
Olczak, T., *See* Deptula, A., 20:1220
Oldenborgh, G.J. van, *See* Aeppli, A., 20:2110
See Cuypers, F., 20:2138
Olerud, H.M., Quality control handbook in mammography: Radiation Protection - Booklet 2, 20:1924 (R;NO;In Norwegian)
Oliva, C., Anisotropic quantum spin fluid and anisotropic quantum spin glass formation in La-cuprate-based catalysts for phenol oxidation, 20:1351 (IA;PL)
Oliveira Filho, O.B. de, Exergetic analysis of refrigeration system of the Pelletron-Linac particle accelerator of the University of Sao Paulo, 20:1552 (I;BR;In Portuguese)
Oliveira Junior, S. de, *See* Oliveira Filho, O.B. de, 20:1552
Oliveira, S.R., Generalized relaxation theory and vortices in plasmas, 20:2009 (R;US)
Oliver, C.E., Adventures in supercomputing, a K-12 program in computational science: An assessment, 20:1427 (R;US)
See Tonn, B.E., 20:930
Oliver, D.R., An investigation of preferential sputtering from single-phase α-and β- Cu/Zn alloys, 20:1122 (IA;AU)
Olovsson, I., Polarization effects on the electron density of lone pairs, 20:2305 (IA;PL)
See Ptasiewicz-Bak, H., 20:2339
Olsen, C.W., Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 1, 20:1690 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 2, 20:1691 (R;US)
Olson, C.L., *See* Rose, D.V., 20:2446
Olsson, W.A., Stiffness and strength properties of natural fractures from north ramp drill holes, 20:467 (R;US)
See Holcomb, D.J., 20:123
Omar, A.A., A software package to process an INIS magnetic tape on the VAX computer, 20:2531 (R;EG)
See Mohammed, F.A., 20:821
Omatete, O.O., Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics, 20:1172 (R;US)
Omran, M., *See* Abdel Wahab, M.M., 20:640
Ono, M., *See* Kawamura, M., 20:1571
Onodera, Toshio, *See* Nishikawa, Tomoyuki, 20:1569
Onyszkiewicz, I., Formation of iron carbide-nitrides by mechnochemical reaction between iron and organic H(CN)- ring compounds, 20:1180 (IA;AU)
See Campbell, S.J., 20:2318
Ootsuyama, Akira, Threshold-like dose response of skin carcinogenesis by repeated beta irradiation in mice, 20:1926 (RA;JP;In Japanese)
Opat, G.I., On the effects of gravitational fields on the electrical properties of matter, 20:2006 (R;AU)
See Allman, B.E., 20:2004
Opresko, D.M., Toxicological benchmarks for wildlife: 1994 Revision, 20:457 (R;US)
Ordonez, J.F., *See* Oliveira Filho, O.B. de, 20:1552

Orelovich, O.L., *See* Buczkowski, M., 20:598
Orlando, R.J., *See* McDonald, C.F., 20:770
Orlov, A., *See* Gurarie, V., 20:1216
Orteu, S., *See* Igo-Kemenes, P., 20:2128
Osgood, R.M. Jr., Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies, 20:1375 (R;US)
Oshimo, Noriyuki, *See* Kizukuri, Yoshiki, 20:2139
Osman, R., Molecular mechanisms in radiation damage to DNA: Progress report, 20:1914 (R;US)
Osman, S.M., Structural and thermodynamic properties of 3-d transition metals: Pseudopotential theory revisited, 20:1347 (R;XA)
Osnes, E., *See* Engvik, L., 20:2223
Osotchan, T., Tunneling current in $Al_x Ga_{1-x} As/ Al_y Ga_{1-y} As/GaAs$ double barrier quantum well structures, 20:2393 (IA;AU)
Ostrom, M.J., Acceptance test procedure, 241-SY-101/241-C-106 shot loading system, 20:374 (R;US)
Ostrowski, K., *See* Stachowicz, W., 20:1395, 20:1396, 20:1402
Oswald, R., Large-area triple-junction a-Si alloy production scaleup: Annual subcontract report, 17 March 1993–18 March 1994, 20:686 (R;US)
Otake, Yuji, *See* Hanaki, Hirofumi, 20:1575
See Yamaguchi, Seiya, 20:1576
Otsu, Hiroshi, Influence of dose-rate on tumorigenesis in mice irradiated with gamma-rays from cesium 137, 20:1925 (RA;JP;In Japanese)
Ott, D.S., Stable isotopes of hydrogen and oxygen in surface water and ground water at selected sites on or near the Idaho National Engineering Laboratory, Idaho, 20:1783 (R;US)
Ott, J., Results of the Baden-Wuerttemberg cultivation experiments with sunflowers, soybeans and flax plants, 1992, 20:619 (I;DE;In German)
Ottinger, P.F., *See* Rose, D.V., 20:2446
Otto, S.W., *See* Martin, O.C., 20:2542
Ouvry, S., On δ perturbative interactions in the Aharonov-Bohm and Anyon models, 20:1996 (R;FR)
See Comtet, A., 20:1992
See Dasnieres de Veigy, A., 20:2021
Overbeek, R., *See* Gilbert, W., 20:1864
Overmann, P., *See* Bernreuther, W., 20:2125
Ovodkov, I.V., *See* Waligorski, M.P.R., 20:1920
Owczarczyk, A., Investigation of industrial effluent dilution and self-purification in the river, 20:592 (IA;PL)
See Szpilowski, S., 20:593
Owczarczyk, H.B., The applied L-glutamine in gamma and electron dosimetry, 20:1639 (IA;PL)
Owens, K.J., Buried waste integrated demonstration Fiscal Year 1993 close-out report, 20:266 (R;US)
Owens, K.W., *See* Wood, D.E., 20:238
Oyama, Yukio, *See* Maekawa, Fujio, 20:2439
Ozaki, S., *See* Yamakawa, H., 20:207, 20:1437

P

Pacheco, J.E., *See* Ghanbari, C., 20:702
Padial, N.T., Status of CFDLIB performance tests on the T3D, 20:1475 (R;US)
Padilla, D.D., *See* Schake, A.R., 20:503
Paduch, W., Double-fed asynchronous machine with electronic inverter as 3 phase AC generator for constant frequency and voltage with variable speed drive, preferred as wave generator on ships. Vol. 1: Final report, 20:1436 (I;DE;In German)
Paecharien, A., *See* Poramatikul, N., 20:1416
Paffett, M.T., Evaluation of no-clean solder process designed to eliminate the use of ozone-depleting chemicals, 20:1763 (R;US)
See Quagliano, J.R., 20:1503
Page, N.W., *See* Fitzsimmons, J.R., 20:1184
See Lwin, M.J., 20:1179
Pailthorpe, B.A., *See* Marks, N.A., 20:2354
Pailthrope, B.A., *See* Guan, P., 20:2350
Pairsuwan, W., *See* Godfrey, L., 20:1634
Palige, J., *See* Chmielewski, A.G., 20:595
See Dziewonski, Z., 20:604
See Harasimowicz, M., 20:594
Palounek, A.P.T., Proceedings of the Workshop on Simulating Accelerator Radiation Environments, 20:1521 (R;US)
Palut, J.M., *See* Bresard, I., 20:221
Palyska, W., Electron beam induced purification of air by removing the volatile organic compounds, 20:600 (IA;PL)
Panchenko, I.P., *See* Zagorodnij, A.G., 20:2413
Panczyk, E., Identification of 16. century paintings of the Malopolska School by means of IRNAA, 20:1314 (IA;PL)
Pande, P.K., Application of integrated reservoir management and reservoir characterization to optimize infill drilling: Quarterly technical progress report, June 13, 1994–September 12, 1994, 20:118 (R;US)
Pankov, A.A., Z - Z' and exotic lepton mixing in $e^+e^- \rightarrow W^+W^-$ at high energy with polarized beams, 20:2131 (RA;DE)
Panov, V.A., *See* Tikhonovskij, M.A., 20:1223
Panyatipsakul, T., *See* Polphong, P., 20:1851
Panyatipsakul, Y., Study on alpha-spectrometry of transuranic elements in environmental samples, 20:1312 (IA;TH;In Thai)
Panyo, O., *See* Sai-ubol, N., 20:1306
Papadopoulos, C.G., Single W production at NLC, 20:2116 (RA;DE)
Papadopoulos, G., A covariant canonical description of Liouville field theory, 20:2067 (R;AU)
The space of solutions of Toda field theory, 20:2068 (R;AU)
Papmichael, K.M., *See* Beltran, L.O., 20:1021
Paradkhun, V., *See* Boonyawan, D., 20:1632
Park Seongwon, Current status of spent fuel management in the Republic of Korea and design concept of the interim spent fuel storage facility, 20:201 (RA;XA)
Parker, B.R., *See* Boles, J.L., 20:1035
Parker, J.C., *See* Goretta, K.C., 20:1168
Parliman, D.J., *See* Cecil, L.D., 20:1784
Parmeter, J.E., Characterization and electrical properties of copper films grown via direct liquid coinjection of (hfac)Cu(TMVS) and TMVS, 20:1163 (R;US)
Parrish, D., *See* McLaughlin, S.B., 20:630
Passerini, A., *See* Machado Junior, M.A., 20:1877
Pastore, G., Numerical solution of the optimized random phase approximation, 20:1348 (R;XA)
Patra, B.K., *See* Singh, C.P., 20:2085
Pattanachak, C., *See* Pleehachinda, R., 20:1881
See Tojinda, N., 20:1882
Pattanachak, S., *See* Pleehachinda, R., 20:1881
See Tojinda, N., 20:1882
Patterson, B.C., *See* Hertel, E.S. Jr., 20:1682
Patton, B.D., *See* Ramey, D.W., 20:293
Paul, P.H., Correlations for the OH $A^2\Sigma^+(v'=0)$ electronic quenching cross-section, 20:1424 (R;US)
Pauly, T.R., *See* Lamberd, D.L., 20:360
Paver, N., *See* Pankov, A.A., 20:2131
Pavlenko, O.P., *See* Kaempfer, B., 20:2238
See Peshier, A., 20:2082
Pavlenko, V.B., *See* Korzhik, M.V., 20:1282
Pavloff, N., Discrete symmetries in the Weyl expansion for quantum billiards, 20:1998 (R;FR)
Shell structure in faceted metal clusters, 20:2363 (R;FR)
Pawlukojc, A., Neutron spectroscopy studies of amino-acids, 20:2340 (IA;PL)
Pearce, K.L., Void fraction instrument acceptance test procedure, 20:1676 (R;US)
Peck, H.D., Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, April 30, 1991–April 30, 1992, 20:1847 (R;US)
Peck, H.D. Jr., Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, 20:1846 (R;US)
Peehs, M., AFR storage in Germany - Possibilities and prospects, 20:197 (RA;XA)
Pegg, I.L., *See* Feng, X., 20:217
Pei, S., *See* Balachandran, U., 20:134
Peigneux, J.P., *See* Korzhik, M.V., 20:1282
Pellaud, B., NPT and the peaceful use of nuclear energy, 20:951 (I;XA)
Peltier, W.R., *See* Bush, A.B.G., 20:1716

Penalva, J.M., To a cooperating approach for plant operator aid, 20:164 (R;FR;In French)
See Benkhannouche, S., 20:222
Pendergrass, R.A. II, Volatiles combustion in fluidized beds: Technical progress report, 4 June 1994–3 September 1994, 20:1423 (R;US)
Pendleton, R., Broad-band, multi-kilowatt, vacuum, HOM waveguide loads for the PEP-II RF cavity, 20:1613 (R;US)
Peng, J.L., *See* Bursill, L.A., 20:2345
See Gurarie, V., 20:1216
See Qian, H., 20:2352
Peng, S., On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic, 20:1731 (RA;US)
Penkalla, H.J., *See* Wolters, J., 20:1147
Penland, R.C., Error analysis of the quadratic nodal expansion method in slab geometry, 20:2277 (R;US)
Perera, K.K.Y.W., Introduction to the national energy situation, 20:909 (I;LK)
Peresypkin, V.V., Coherent and incoherent elastic proton scattering by ^{6} Li nucleus at intermediate energies., 20:2230 (R;UA)
Peretz, J., *See* Tonn, B., 20:1826
Perez, J.M., *See* Anantatmula, R.P., 20:323
Perkins, E., *See* Larionov, V., 20:1866
Perkins, E.A., *See* Brunson, M.L., 20:367
Perret, C., *See* Bede, M., 20:790
Perrot, G., *See* Beingessner, S.P., 20:1584
See Bertsch, Y., 20:1583
Perry, M.D., *See* Crane, J.K., 20:1510
Persson, P.E., Training for the qualification and competence of nuclear power plant personnel in Sweden, 20:2483 (RA;XA)
Peshier, A., An effective model of the quark-gluon plasma with thermal parton masses, 20:2082 (R;DE)
See Kaempfer, B., 20:2238
Pestov, A.B., *See* Barashenkov, V.S., 20:2056
Peters, B.B., Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary, 20:518 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report, 20:519 (R;US)
See Treat, R.L., 20:529
Peters, R., *See* Franz, E.M., 20:240
Peters, R.D., *See* Anantatmula, R.P., 20:323
Peters, R.E., *See* Buttermore, W.H., 20:71
Petersn, G.A., *See* Parmeter, J.E., 20:1163
Peterson, J., *See* Zucca, J.J., 20:713
Peterson, M.E., Integrated demonstrations, integrated programs, and special programs within DOE's Office of Technology Development, 20:922 (R;US)
See Anantatmula, R.P., 20:323
Peterson, R., *See* Rice, P., 20:269
Peterson, R.E., Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994, 20:339 (R;US)
Petravic, M., *See* Prawer, S., 20:2360
Petrenko, V.T., *See* Matsakova, A.A., 20:1228
See Tikhonovskij, M.A., 20:1223
See Tortika, A.S., 20:1230
See Tret'yakov, V.M., 20:1226
Petrin, R.R., *See* Quagliano, J.R., 20:1503
Petti, D.A., *See* Merrill, B.J., 20:2437
Pfannstiel, D., A self-adjusting combustion control system for low-capacity oil-fired heating systems, 20:1014 (I;DE;In German)
Pfanz, H., Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge, 20:1965 (IA;DE)
See Heber, U., 20:1963
Pfingsten, W., Modular coupling of transport and chemistry: theory and model applications, 20:1833 (R;CH)
Pharabod, F., Comparative assessments of solar and conventional power plants, 20:671 (IA;IL)
Phillpp, B.L., Conceptual design analyses for Hanford Site deployable remote spectroscopy systems, 20:413 (R;US)
Philipp, K., Degree of air delivery of the petrol engine in dynamic operation, 20:1064 (I;DE;In German)
Phillips, C.A., Case studies of sewage treatment with recovery of energy from methane, 20:626 (R;US)
Phillips, D.R., Production of high specific activity silicon-32, 20:1419 (PA;US)
Phillips, M.R., *See* Stockton, G., 20:1212
Phillips, R.J.N., *See* Barger, V., 20:2101
Phillips, R.M., *See* Sprehn, D., 20:1594
Phillips, W.S., *See* Rutledge, J.T., 20:122
Phipps, C.R., LISK-BROOM: Clearing near-Earth space debris in 4 years using a 20-kW, 530-nm repetitively pulsed laser, 20:1441 (R;US)
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)
Piao, G., Zeeman spectroscopy of indium acceptor impurity in silicon, 20:1264 (IA;AU)
Piattelli, P., *See* Le Faou, J.H., 20:2212
See Suomijaervi, T., 20:2209
Pick, M., *See* Borgstedt, H.U., 20:1113
Pickard, P.S., *See* Bodette, D.E., 20:1506
Pickett, J.B., *See* Jantzen, C.M., 20:296
Picraux, S.T., *See* Kellerman, B.K., 20:1286
Piechaczek, A., Beta-decay of ^{20}Mg, 20:2227 (R;DE)
See Janas, Z., 20:2226
Piekoszewski, J., *See* Ciurapinski, A., 20:1484
Pietrzak, J., *See* Szyczewski, A., 20:1354
Pigeaud, A.E., Trace species emissions for IGFC, 20:64 (R;US)
Pigott, J.R., *See* Khachan, J., 20:1253
Pilaftsis, A., *See* Ilakovac, A., 20:2103
Pilial, S.M., Preparation and characterisation of certain conducting polymer thin film devices, 20:1254 (IA;AU)
Pillsbury, R.D. Jr., *See* Radovinsky, A., 20:2431
Pin, F.G., Automatic generation of fuzzy rules for the sensor-based navigation of a mobile robot, 20:1038 (R;US)
Pipersky, P., *See* Hoyer, E., 20:1591, 20:1605
Pirek, R.C., *See* Smith, G.P. Jr., 20:762
Piso, M.I., Two dimensional simplicial paths, 20:2051 (R;XA)
Pitkaenen, P., Geochemical modelling of the groundwater at the Olkiluoto site, 20:1861 (R;FI)
Pitman, S.G., *See* Richterich, L.R., 20:1496
Pitner, A.L., *See* Wootan, D.W., 20:397
Piwellek, H., Development and testing of a selvaging manipulator for yielding arch-support underground: Final report, 20:73 (I;DE;In German)
Joint project 'Mining': Transport and assembly aids underground: Final report, 20:74 (I;DE;In German)
Pizzi, J.R., *See* Bedjidian, M., 20:2385
Pleehachinda, R., Optimized nuclear techniques and survey of neonatal chemical hypothyroidism in iodine deficient areas in Thailand - a preliminary report, 20:1881 (IA;TH)
See Tojinda, N., 20:1882
Plivelich, R.F., Nickel hydroxide electrodes in reduced-alkalinity electrolytes, 20:898 (R;US)
Ploenjes, E.C., *See* Bowden, G.J., 20:2376
Plonka, A., Dispersive kinetics of radiation-induced species in condensed media, 20:1391 (IA;PL)
Pluym, T.C., Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)
Pocalyko, A., Trip report, Metals and Controls Corporation, Attleboro, Mass. – September 3, 1953, 20:815 (R;US)
Pogocki, D., An ESR study of sulfur-containing amino acids in aqueous frozen solution, 20:1393 (IA;PL)
OH radicals induced oxidation of sulfur-containing amino acids. An ESR study, 20:1397 (IA;PL)
See Grodkowski, J., 20:1400
Pogorelsky, I., *See* Kimura, W.D., 20:1514
Pogorelsky, I.V., Approach to compact terawatt CO_2 laser system for particle acceleration, 20:1516 (R;US)
Waveguiding by axicon-focused laser beams, 20:1515 (R;US)
Pogosyan, G.S., *See* Kallies, W., 20:2000
Pojdenko, V.K., *See* Abazov, V.M., 20:1888
Pokorski, S., *See* Rosiek, J., 20:2106
Pol, A. van der, *See* Michalik, J., 20:1382, 20:1398

Polansky, G.F., Issues in the flight qualification of a space power reactor, 20:793 (R;US)
Polkowska-Motrenko, H., *See* Kulisa, K., 20:591
See Szopa, Z., 20:1321
Polphong, P., Cesium-137 in the marine environment of the gulf of Thailand, 20:1851 (IA;TH;In Thai)
Polsuksiri, C., A study of using polythiol compounds and 2-ethylhexyl-acrylate with carbon tetrachloride as sensitizers for radiation vulcanization of natural rubber latex, 20:1379 (I;TH;In Thai)
Poltoratskij, Yu.B., *See* Dejneka, T.G., 20:1225
Polvado, R.O., Two-photon physics: Physics Publication No. 83-175, 20:2148 (R;US)
Pond, D.J., *See* Stenehjem, E.J., 20:933
Ponomarev, V.Yu., *See* Belyaev, S.N., 20:2264
Pontau, A.E., *See* Roberts, M.L., 20:1336
Pool, K.H., *See* Ligotke, M.W., 20:308
Pope, G.A., Innovative techniques for the description of reservoir heterogeneity using tracers: Final report, October 1992–December 1993, 20:95 (R;US)
Popel, S.O., Techno-electronic comparison of advanced solar power plant schemes, 20:672 (IA;IL)
Poplyko, I., *See* Rolevitch, V., 20:837
Popov, A.D., Constraints, complex structures and quantization, 20:1999 (R;XJ)
Popov, V.S., *See* Mosevitskij, I.S., 20:782
Popov, V.V., Monte Carlo study of electron-plasmon scattering effects on hot electron transport in GaAs, 20:2343 (R;XA)
Poramatikul, N., Radiochemical control of disida kit, 20:1416 (IA;TH;In Thai)
Portal, R., Study on the design of new spent fuel intermediate storage facilities in France, 20:195 (RA;XA)
Porter, G., *See* Larionov, V., 20:1866
Posorski, R., *See* Biermann, E., 20:999
Posthaus, A., Upper limit determination for the τneutrino mass with OPAL detector, 20:2185 (R;DE;In German)
Poston, T.M., *See* Geist, D.R., 20:1969
Potier, J.M., *See* Bresard, I., 20:221
Pott, J., *See* Holland, J.F., 20:314
Pottmeyer, J.A., *See* LeClair, M.D., 20:361
Powell, G.L., Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)
Power, R.C., *See* Reeves, R.J., 20:2332
Poyer, D.A., Estimating household fuel oil/kerosine, natural gas, and LPG prices by census region, 20:997 (R;US)
Praestegaard, S., *See* Morthorst, P.E., 20:995
Prasad, Y.S.R., Training for qualification and competence of nuclear power plant personnel in India, 20:2477 (RA;XA)
Prather, W.S., Spectrophotometric probe, 20:1672 (PA;US)
Prawer, S., Conductivity in insulators due to implantation of conducting species, 20:2360 (R;AU)
See Allen, M.G., 20:1289
See Bursill, L.A., 20:2345
See Dooley, S.P., 20:2355
See Gurarie, V., 20:1216
See Kostidis, L., 20:1182
See Weiser, P.S., 20:1257
Prenger, C., *See* Schake, A.R., 20:503
Prestwich, K.R., *See* Neau, E.L., 20:1525
Pretrel, H., *See* Bede, M., 20:790
Preussler, T., Numerical description of creep of highly creep resistant alloys, 20:1140 (I;DE;In German)
Pricaupenko, L., Quantum prewetting transitions in liquid ^{3}He, 20:2396 (R;FR)
Price, L.L., Characteristics of special-case wastes potentially destined for disposal at the Nevada Test Site, 20:316 (R;US)
Price, M.E., *See* Bailey, K.C., 20:1098
Price, R.H., *See* Olsson, W.A., 20:467
Price, V., *See* Carlton, W.H., 20:253
Prince, M.B., Photovoltaics: Present status and comparative analyses, 20:673 (IA;IL)
Prinz, B., Forest decline research in Northrhine-Westphalia at the regional research site Eggegebirge/Velmerstot, 20:1809 (IA;DE;In German)
Proebstle, P., *See* Kreutzer, K., 20:1811
Prokop, J., Potential for the development and manufacture of radiopharmaceutical kits, 20:1413 (IA;CZ;In Czech)
Proto, A.N., *See* Gruver, J.L., 20:1985
Protogenov, A.P., Quantum group random walks in strongly correlated 2+1 D spin systems, 20:2390 (R;XA)
See Litvak, A.G., 20:1983
Protopopescu, V., *See* Rao, N.S.V., 20:2554
Pruente, W., Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions, 20:53 (R;DE;In German)
Pruppacher, H.R., The scavenging of atmospheric pollutants by clouds and precipitation by means of a vertical wind tunnel: Final report, 20:1743 (R;DE;In German)
Przetakiewicz, P., Analysis of alloys by energy dispersive X-ray fluorescence method, 20:1326 (IA;PL)
Przybytniak, G.K., *See* Ambroz, H.B., 20:1401
Ptasiewicz-Bak, H., Chemical bonding and covalency in $NiSO_4 \cdot 6H_2O$ by measurement of charge and spin densities, 20:2339 (IA;PL)
See Olovsson, I., 20:2305
Puclin, T., Mechanochemically induced reduction of zircon sand, 20:1214 (IA;AU)
Pugachev, N.S., *See* Tret'yakov, V.M., 20:1226
Pugh, K.C., Photocatalytic destruction of atrazine using TiO_2 mesh, 20:1372 (R;US)
Toxicity and physical properties of atrazine and its degradation products: A literature survey, 20:1369 (R;US)
See Kiserow, D.J., 20:1371
Puglio, N., *See* Machado Junior, M.A., 20:1876
Pujet, D., *See* Nimal, J.C., 20:188
Pukhov, A.E., *See* Boos, E.E., 20:2142
Pulkkinen, U., Reliability analysis of software based safety functions, 20:747 (R;FI;In Finnish)
Pulsipher, B.A., Data quality objectives process applied to characterization of Hanford tanks containing ferrocyanide, 20:310 (R;US)
Punkar, G., Measurement of the average lifeetime of B hadrons at SLD, 20:2199 (R;US)
Punyodom, W., *See* Grudpan, K., 20:1308
Purdhomme, J.W., *See* Haas, J.C., 20:13
Puri, S., *See* Biswal, B., 20:2300
Purucker, S.L., *See* Barnes, P.R., 20:885
Purucker, S.T., *See* Miller, P.D., 20:499
Pustyl'nik, B.I., *See* Andreev, A.N., 20:2265
Putrasreni, N., *See* Tojinda, N., 20:1882
Puzynin, I.V., *See* Akishin, P.G., 20:2543

Q

Qaiyum, A., Far-infrared and submillimeter spectroscopy of photodissociation regions, 20:2282 (R;XA)
Qian, H., Monte Carlo simulation of nanodomain textures in relaxor-type lead scandium tantalate, 20:2352 (IA;AU)
Quack, B., Volatile halogenated hydrocarbons in the marine atmosphere: Concentrations, sources and mass budgets over North Sea and Baltic Sea, 20:1741 (I;DE;In German)
Quagliano, J.R., An investigation of the chemical and physical properties of pristine, electrochromically damaged, and photochromically damaged $KTiOPO_4$ (KTP) using surface analytical and optical spectroscopic techniques, 20:1503 (R;US)
Queiroz, M., Particulate behavior in a controlled-profile pulverized coal-fired reactor: A study of coupled turbulent particle dispersion and thermal radiation transport: Quarterly technical progress report, December 15, 1993–March 14, 1994, 20:89 (R;US)
Queval, J.C., *See* Brochard, D., 20:789
Quick, C.R., *See* Shimada, Tsutomu, 20:1765
Quinn, R., *See* Damle, A.S., 20:17
Quintas, P.Z., Measurement of W and Z production cross-sections in $p\bar{p}$ collisions at $\sqrt{s} = 1.8$ TeV, 20:2154 (R;US)

R

Radel, R.J., Industrial waste needs assessment: Phase 1, 20:1054 (R;US)
Radicella, S.M., *See* Kartal, S., 20:2014
Radny, M.W., Ab initio Hartree-Fock study of the B/Si(001) 2 x 1 adsorption system, 20:1349 (IA;AU)
Radovinsky, A., Joule heating of the ITER TF cold structure: Effects of vertical control coil currents and ELMS, 20:2431 (R;US)
Radulovic, P.T., *See* Solomon, P.R., 20:729
Radway, J.C., *See* Wilde, E.W., 20:443
Ragoucy, E., *See* Coquereaux, R., 20:2060
See Madsen, J.O., 20:2063
Rahman, F.A., *See* Ahmed, E.E., 20:804
Rai, D., Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)
Rai, G., Exclusive study of nuclear collisions at the AGS, 20:2272 (R;US)
Raichur, A.M., *See* Misra, M., 20:40
Raivo, B.D., INEL Operable Unit 7-13 containment and stabilization configuration option, 20:263 (R;US)
Rakitskaya, E., *See* Hoth, C.W,, 20:791
Ralph, M.E., *See* Ghanbari, C., 20:702
Ramadan, A., *See* Souka, N., 20:1377
Ramakaeva, R.F., *See* Malikov, V.Ya., 20:1227
Ramer, R., Hyperfine magnetic fields of rare earths substituted ferrimagnetics, 20:1209 (IA;AU)
See Ionescu, H.M., 20:1204
Ramey, D.W., Proposed Atomic Energy of Canada Ltd. ^{99}Mo waste calcination process, 20:293 (R;US)
Ramirez, G., *See* Biscardi, R., 20:1528
Ramsey, A.T., D-T radiation effects on TFTR diagnostics, 20:2420 (R;US)
Ramstein, B., *See* Rousteau, S., 20:2161
Ransom, V.H., *See* Shieh, A.S., 20:877
Rao, K.R.P.M., *See* Stohl, F.V., 20:52
Rao, K.V.M., Training-related infrastructure development and evaluation of training performance, 20:2491 (RA;XA)
Rao, M., The λ-bar exponent for conservative systems, 20:2298 (R;XA)
See Bhattacharya, A., 20:2299
Rao, M.V.S., Search for Centauro events in the DO Detector at Fermilab collider, 20:2155 (R;US)
Rao, N.S.V., Learning algorithms for feedforward networks based on finite samples, 20:2554 (R;US)
Unknown-terrains navigation of a mobile robot using an array of sonars, 20:1432 (R;US)
Rappe, A.M., *See* Kralik, B., 20:2397
Raptis, F., *See* Cramer, G., 20:1059
Rasch, L., The Re-used House - energy analysis of the production: An evaluation of the difference in energy consumption in connection with the re-used house and a conventional building, 20:1017 (R;DK;In Danish)
Raschik, A., *See* Vagov, A.V., 20:2320
Rasmussen, T.C., *See* Bassett, R.L., 20:1824
Ratzesberger, R., *See* Rheinlander, J., 20:674
Rau, J., *See* Campbell, J.A., 20:302
Ravnik, M., Comparison of different calculational methods for spent fuel storage criticality calculations, 20:204 (RA;XA)
Rawlinson, K.S., *See* Ghanbari, C., 20:702
Raymond, T.D., *See* Henson, T.D., 20:1666
Read, A.L., Precision determination of the Z° resonance parameters, 20:1655 (R;NO)
Read, D., *See* Bennett, D.G., 20:1804
Reagan, W.J., The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992), 20:26 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 23: Quarterly technical progress report for third quarter fiscal year 1992 (April 1–June 30, 1992), 20:27 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992), 20:28 (R;US)
Rebagay, T.V., Evaluation of FTIR-based analytical methods for the analysis of simulated wastes, 20:420 (R;US)
Reber, M., *See* Hast, C., 20:1602
Recami, E., *See* Salesi, G., 20:2048
Reeb, J.C., *See* Freund, R.W., 20:2553
Reed, C.B., *See* Evtushenko, I.A., 20:2429, 20:2430
Reed, R.P., *See* Toma, L.S., 20:1110
Reese, G., *See* James, G., 20:1445
Reeves, R.J., Accumulated photon echoes in Nd^{3+}-doped CaF_2 and disordered CaF_2-YF_3 crystals, 20:2332 (IA;AU)
Reginato, L.L., *See* Kwan, J.W., 20:1890
Regnier, E.P., *See* Wood, D.E., 20:238
Reh, S., Reliability analysis of complex components using the stochastic finite element method, 20:733 (R;DE;In German)
Rehak, M.L., *See* Shutt, R.P., 20:1542
Rehak, P., Semiconductor detectors in nuclear and particle physics, 20:1617 (R;US)
Rehfuess, K.E., Possibilities and limits of fertilization and melioration liming (as measures to fight 'novel' forest disease), 20:1814 (IA;DE;In German)
Rehm, W., Analytical and experimental investigations of the passive heat transport in HTRs under severe accident conditions, 20:779 (RA;XA)
Reich, F.R., *See* Philipp, B.L., 20:413
Reid, R.S., *See* Woloshun, K., 20:1649
Reifenrath, W., Validation of an in vitro test method to evaluate materials against liquid HD, 20:1700 (R;US)
Reifman, J., Cooperative research and development for artificial intelligence based reactor diagnostic system, 20:820 (R;US)
Reilly, J.J., *See* Adzic, G.D., 20:895
Reiman, L., Nuclear energy research until 2000: The necessity of the nuclear energy research until the year 2000 and a proposal for the organizational model of the research, 20:2515 (R;FI;In Finnish)
Reimus, P.W., Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures, 20:288 (R;US)
Rein, D., *See* Boyarkin, O., 20:2192
Reinhold, G., Long-time testing of the diagnosis and trend system for marine diesel engines: Final report, 20:1067 (I;DE;In German)
Reinholdtsen, P., Three-dimensional image processing for acoustic microscopy, 20:1497 (R;US)
Reiser, C., *See* Krumpelt, M., 20:1006
Reiter, D., *See* Maddison, G.P., 20:2440
Rekalo, M.P., *See* Sitnik, I.M., 20:2258
Rekstad, J., *See* Guttormsen, M., 20:2274
Remec, J., *See* Ravnik, M., 20:204
Rempel, D., *See* Tittiranonda, P., 20:2564
Remund, K.M., Tank characterization report for Single-Shell Tank B-111, 20:299 (R;US)
Tank characterization report for Single-Shell Tank T-102, 20:300 (R;US)
Renard, F.M., *See* Bilenky, M., 20:2115
See Layssac, J., 20:2133
Repond, J., *See* Derrick, M., 20:2145
Ressing, D., *See* Albrecht, H., 20:2144, 20:2146
Rest, J., A mechanistic model for radiation-induced crystallization and amorphization in U_3Si, 20:1169 (R;US)
Reunanen, M., *See* Nissilae, M., 20:1450
Reuter, A., *See* Kaiser, K., 20:722
Revankar, S.T., *See* Ishii, M., 20:881
Reynolds, E.L., *See* Polansky, G.F., 20:793
Reynolds, J.G., Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Reza, K.A., Magnetic properties of nano-materials of Sm_3 $(Fe_{1-x}Ti_x)_{29}$ $(0.04 \leq x \leq 0.06)$, 20:1132 (IA;AU)
Rezaev, V.E., Communication VME-KK009 interface to control CAMAC equipment, 20:1641 (R;XJ;In Russian)
Rheinlander, J., The technoeconomic evaluation of solar steam supply to fossil fired combined power cycle, 20:674 (IA;IL)

Rhodes, C.K., Molecular design concept for multi-kilovolt x-ray amplification: Final report, December 13, 1990–December 14, 1993, 20:2279 (R;US)
Rhodes, E.J., *See* Maddock, R.H., 20:1836
Riccadonna, X., *See* Bertsch, Y., 20:1583
Rice, P., Test plan for the remote conveyance and innovative end effector demonstration, 20:269 (R;US)
Rich, H.S., LABCORE post release 1.0 development system project management plan, 20:406 (R;US)
Richard, J.M., *See* Fleck, S., 20:2002
Richardson, J.G., *See* Raivo, B.D., 20:263
Richardson, P.E., *See* Yoon, R.H., 20:5
Riches, M.R., Ocean Margins Program: Closure on the global carbon cycle: Program description, 20:1845 (R;US)
Richter, K., *See* Ullmo, D., 20:2024
Richterich, L.R., Phase I ResonantSonic CRADA report, 20:1496 (R;US)
Ricketts, B.W., Contact anomalies in the integral quantum Hall Effect, 20:1273 (IA;AU)
Rider, W.J., Accurate solution algorithms for incompressible multiphase flows, 20:1476 (R;US)
Rie, K.T., Low cycle fatigue at increased temperature under operating conditions, 20:1103 (I;DE;In German)
Riechers, D.M., *See* Richterich, L.R., 20:1496
Riedel, W.J., *See* Kist, R., 20:1664
Rieger, D.J., *See* Baca, A.G., 20:1505, 20:2307
See Howard, A.J., 20:1507
See Shul, R.J., 20:1287
Riehl, G., Study of the many-dimensional transverse phase-space distributions of intense ion beams, 20:1550 (R;DE;In German)
Rieling, J., *See* Hast, C., 20:1602
Riemann, T., *See* Akhundov, A., 20:2158
See Bardin, D., 20:2112
Riemer, R.L., Assessment of the current status of basic nuclear data compilations, 20:2202 (R;US)
Ries, H., Thermodynamics of solar power conversion, 20:675 (IA;IL)
Rigol, J., New statistical function for the angular distribution of evaporation residues produced by heavy ions, 20:2262 (R;XJ)
Riley, D.C., *See* Bronson, M.C., 20:321
Riley, J., *See* Con Foo, Jenice, 20:2392
Riley, J.D., *See* Bocquet, A.E., 20:2321
See Sheils, W., 20:2302
Rimmer, R., *See* Neubauer, M., 20:1614
See Pendleton, R., 20:1613
See Schwarz, H., 20:1610
Ring, H.F., *See* Brinn, M.S., 20:872
Rintamaa, R., *See* Reiman, L., 20:2515
Rippy, G.L., BCE selector valves and flow proportional sampler, 20:1658 (R;US)
Ristig, M.L., *See* Gernoth, K.A., 20:2388, 20:2389
Ritchie, H., *See* Peng, S., 20:1731
Ritter, B., *See* Laemmer, H., 20:809
Ritter, H.G., Flow and multifragmentation in nuclear collisions at intermediate energies, 20:2271 (R;US)
Rittman, B.E., Fundamental quantitative analysis of microbial activity in aquifer bioreclamation, 20:1780 (R;US)
Rittmann, P.D., *See* Seitz, R.R., 20:239
Robarge, W.P., *See* Bruck, R.I., 20:1817
Robershotte, M., *See* Armacost, L.L., 20:301
Roberts, K.E., *See* Novak, C.F., 20:315
Roberts, M.L., The new nuclear microprobe at Livermore, 20:1336 (R;US)
Robertson, P.J., *See* Baca, A.G., 20:1505, 20:2307
Robertus, R.J., Dual shell pressure balanced reactor vessel: Final project report, 20:304 (R;US)
Robinson, B.A., *See* Reimus, P.W., 20:288
Robinson, J.M., *See* Foy, B.R., 20:290
Robinson, R.A., *See* Bourke, M.A.M., 20:1330
Robinson, W.A., Transient eddy feedback and low-frequency variability, 20:1732 (RA;US)
Roblin, P., Model of electronic energy relaxation in the test-particle Monte Carlo method, 20:148 (R;FR)
Roblyer, S.P., Plutonium and tritium produced in the Hanford Site production reactors, 20:563 (R;US)
Rodriguez, J.A., *See* Kuhn, M., 20:1340
Rodriguez, M.A., Behaviour of the reaction front for A + B → C diffusion-reactions systems: An analytic approach, 20:2012 (R;XA)
Roeckl, E., *See* Janas, Z., 20:2226
Roedig, M., *See* Hahne, M., 20:1236
Roege, P.E., B Plant retired HEPA filters engineering study (Project W-059), 20:358 (R;US)
Roff, A., *See* Rutledge, J.T., 20:122
Roganov, V.S., *See* Dem'yanov, A.V., 20:1555
Rogers, C.D., The Savannah River Site's groundwater monitoring program: First quarter 1994, 20:458 (R;US)
Rogers, Y.C., *See* Paffett, M.T., 20:1763
Rohay, V.J., *See* Hagood, M.C., 20:1843
Rohden, R., *See* Krabbe, N., 20:720
Roles, G.W., *See* Wood, D.E., 20:238
Rolevitch, V., Report of the Chernobyl state committee of the Republic of Belarus, 20:837 (IA;PL)
Roloff, A., Morphological changes in the crowns of European beech (Fagus sylvatica L.) and other deciduous tree species, 20:1956 (IA;DE)
Romao, J.C., *See* Eboli, O.J.P., 20:2105
Romero, A., *See* Zucca, J.J., 20:713
Romero, D.A., *See* Schake, A.R., 20:503
Rood, A.S., GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
Rook, M., Strangeness production in the pp and pp scattering, 20:1646 (R;DE;In German)
Rope, R., U.S. Fish and Wildlife Service lands biomonitoring operations manual, 20:1793 (R;US)
Rosato, A.D., Quarterly progress report, April 1, 1994–June 30, 1994, 20:1671 (R;US)
Rose, D.V., Transport efficiency studies for light-ion inertial confinement fusion, 20:2446 (R;US)
Rose, F.L., Autoradiographic studies of ^{65}Zn adsorption by periphyton, 20:1908 (R;US)
Rose, S.C. Jr., Safety approach and engineered safety systems for the APT ^{3}He Target/Blanket System, 20:1694 (R;US)
See Mensink, D.L., 20:1693
Rosenblum, B.Z., Copper metallization of stainless steels: Final report, 20:1149 (R;US)
Rosenfeld, G., Manipulation of growth mode in the homoepitaxy illustrated by an example of Ag(111), 20:1148 (R;DE;In German)
Rosengard, A., *See* Roblin, P., 20:148
Rosiek, J., Perspectives of neutral supersymmetric Higgs boson searches at a 500 GeV e^+e^- linear collider, 20:2106 (RA;DE)
Rosiek, O., *See* Waligorski, M.P.R., 20:1920
Rosier, L.H., *See* Vernotte, J., 20:2250
Rosier-Lees, S., Electroweak interference at LEP: Measurements of $A_{FB}{}^{b}$ and $A_{FB}{}^{c}$ at LEP, 20:2177 (R;FR)
See Beingessner, S.P., 20:1584
Rosinski, S.T., *See* Nakos, J.T., 20:883
See Schubert, L.E., 20:1162
Ross, S., *See* Nowlen, S.P., 20:812
Ross, W.C., A two-dimensional simulation of tritium transport in the vadose zone at the Nevada Test site, 20:1850 (R;US)
Ross, W.M., The UK programme and experience on training and qualification for nuclear power plant personnel, 20:2485 (RA;XA)
Rossiter, P., *See* Tapanes, E., 20:1258, 20:1661
Rossiter, P.L., *See* Lim, M., 20:1125
See Luo, H.H., 20:1197
Rost, M., *See* Dueerkop, A., 20:731
Rostovtsev, Yu.V., *See* Protogenov, A.P., 20:2390
Rotbard, G., Blocking effect in the $16^+ \rightarrow 16^+$ (p,t) transition on the isomeric $^{178}Hf^{m2}$ target, 20:2244 (R;FR)
See Vernotte, J., 20:2250
Rote, D.M., Improved high speed maglev design, 20:1081 (PA;US)
Integrated null-flux suspension and multiphase propulsion system for magnetically-levitated vehicles, 20:1080 (PA;US)
Rott, W., *See* Gorenflo, D., 20:1473
Roudot, F., *See* Frascaria, R., 20:2252
Rouse, J.K., *See* Treat, R.L., 20:529

Rousseau, S., Δ decay and absorption in nuclei, 20:2161 (R;FR)
Rowan, W.J., *See* Booth, R.S., 20:882
Rowinska, L., A method of gallium purification from arsenic, bismuth, cadmium and iron by gallium remelting under synthetic slags, 20:597 (IA;PL)
Roybal, L.G., *See* Josten, N.E., 20:270
Rozhkov, M., Computer programs for analysis of geophysical data, 20:1973 (R;US)
Rubin, E.S., *See* Kalagnanam, J.R., 20:737
Rubin, J.C., *See* Machado Junior, M.A., 20:1875
Rudycheva, T.Yu., *See* Matsakova, A.A., 20:1228
See Tikhonovskij, M.A., 20:1223
See Tortika, A.S., 20:1230
Rueckl, R., *See* Cuypers, F., 20:2138
Ruegge, J., The formation of coatings on heat exchanger pipe bundles subjected to transverse flow, 20:1469 (I;DE;In German)
Ruehle, M., *See* Borgstedt, H.U., 20:1113
Ruessel, K., Double-fed asynchronous machine with electronic inverter as 3 phase AC generator for constant frequency and voltage with variable speed drive, preferred as wave generator on ships. Vol. 2: Final report, 20:1435 (I;DE;In German)
See Paduch, W., 20:1436
Ruf, T., *See* Su, Z.P., 20:2306
Ruff, D.T., One-trip drum operating instruction, 20:352 (R;US)
Phase III (full scale) agitated mixing test plan, 20:363 (R;US)
Ruggiero, A.G., *See* Haffmans, A.F., 20:1529
Ruhter, W.D., *See* Davis, G., 20:562
Runkel, M., Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)
Rupley, F.M., CHEMKIN2: General Gas-Phase Chemical Kinetics, 20:2538 (CM;US)
Rusanov, K.V., Thermal processes at compacted composite Y Ba_2 Cu_3 O_δ/Ag cooling by liquid nitrogen., 20:1231 (IA;UA;In Russian)
See Topchiashvili, M.I., 20:1279
Russell, D.H., Development of laser-ion beam photodissociation methods: Progress report, December 1991–November 1994, 20:1295 (R;US)
Russell, G., *See* Gu, G.D., 20:1218
Russell, G.J., *See* Anderson, A.R., 20:1205
See Cochrane, J.W., 20:2374
See Gamchi, H.S., 20:1202
See Godamanne, G., 20:1203
See Hartman, A., 20:2395
See Martin, J.W., 20:1217, 20:1637
See Miles, P.A., 20:2375
See Sujito, 20:1183, 20:2372
See Sun, H.B., 20:2373
See Zhao, Y., 20:1196, 20:1260
Russell, K.F., *See* Godfrey, R.D., 20:1488
Russell, T.P., *See* Cai, Z., 20:1239
Russell, V.K., Cleanup MAC and MBA code ATP, 20:2566 (R;US)
Conversion to Paradox 4.02 ATP's for MAC and mass balance programs, 20:564 (R;US)
Paradox applications integration ATP's for MAC and mass balance programs, 20:565 (R;US)
See Mullaney, J.E., 20:566
Russu, R., *See* Strugaru, D., 20:1357
Rutherford, J.H., *See* De Lorenzo, D.S., 20:418
Ruti, P., *See* Tosi, E., 20:1738
Rutledge, J.T., Subsurface fracture mapping using microearthquakes detected during primary oil production, Clinton County, Kentucky, 20:122 (R;US)
Rutllant, J., Modelling the day to day wind variability offshore central Chile at about 30 deg. south, 20:718 (R;XA)
On the generation of coastal lows in central Chile, 20:1748 (R;XA)
Ryan, D.S., *See* Baker, R.J., 20:2285
Ryan, F.M., *See* Remund, K.M., 20:299, 20:300
Ryan, J.L., *See* Rai, D., 20:306
Rybkin, I.Yu., *See* Filippov, G.F., 20:2217
Rzewuski, H., Implantation induced amorphization in Si, GaAs, and GaAsP, 20:2356 (IA;PL)

S

Sa, *See* Sedjidian, M., 20:2385
Saad, S.M., Collision integrals for the Lennard-jones (n-6) potential for 23 values of n ranging from 6 to proper to, 20:2287 (R;EG)
Saakov, E.S., Russian programme and experience on nuclear power plant personnel training system development, 20:2481 (RA;XA)
Saam, W.F., *See* Cheng, E., 20:2023
Sabet-Dariani, R., Current-voltage characteristics of porous silicon, 20:1271 (IA;AU)
See Crisp, R.S., 20:2323
Sabine, T.M., The micro pore structure of concrete determined by small angle neutron scattering, 20:2335 (IA;AU)
See Burke, M.D., 20:1636
Sadlo, J., *See* Lukasiewicz, A., 20:1361
See Michalik, J., 20:1382, 20:1398
See Pogocki, D., 20:1393, 20:1397
See Stachowicz, W., 20:1396, 20:1402
Sado, Toshihiko, *See* Yoshida, Kazuko, 20:1940
Sadowski, R.S., *See* Carson, R.D., 20:14
Saegusa, T., R and D on spent fuel storage in Japan, 20:199 (RA;XA)
Saemann-Ischenko, G., *See* Holzapfel, B., 20:1207
Saewert, G., Xwake 1.0 user's manual, 20:1535 (R;US)
Safar, S., *See* Greimann, L., 20:879
Safargar, S., *See* Adewumi, M.A., 20:128
Sagajdak, R.N., *See* Andreev, A.N., 20:2265
Sahimi, M., *See* Tsotsis, T.T., 20:57
Sai-ubol, N., Adsorption of silver ion on activated carbon via radiochemical method, 20:1306 (IA;TH;In Thai)
Saidi, E.H., HyperKaehler metrics building and integrable models, 20:2040 (R;XA)
On D=2 (1/3, 1/3) supersymmetric theories 1, 20:2038 (R;XA)
On D=2 (1/3,1/3) supersymmetric theories 2, 20:2039 (R;XA)
See Kadiri, A., 20:2052
Salisbury, H.E., *See* Ellis, T.W., 20:1143
Saint, A., *See* Laird, J.S., 20:2327
Saisomboon, S., Property improvement by gamma polymerization of methyl methacrylate impregnated local Thai wood Yang (Dipterocarpus Sp.), 20:1251 (IA;TH;In Thai)
Saito, F., *See* Takami, A., 20:1086
Saito, Yoshio, *See* Michizono, Shinichiro, 20:1567
Sajkowski, D.J., *See* Cronauer, D.C., 20:19, 20:20, 20:21, 20:22, 20:23, 20:24, 20:25
Sakakura, Teruyo, Extracellular matrix in carcinogenesis, 20:1935 (RA;JP;In Japanese)
Sakamoto, Mitsunori, 60MW S-band pulse klystron, 20:1566 (RA;JP;In Japanese)
Sakogawa, K., *See* Hasegawa, K., 20:1563
Salary, L., *See* George, M.A., 20:1621
Salati, P., The laboratory and astrophysical constraints on the neutrino charge radius, 20:2197 (R;FR)
Salazar, J.A., *See* Stampfer, J.F., 20:1487
Salazar, M.A., *See* Gobby, P.L., 20:2442
Salesch, S.G., Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha^2_s)$, 20:2143 (R;DE;In German)
Salesi, G., On the field theory of the extended-type electron, 20:2048 (R;XA)
Salguero, D.E., *See* Hull, D.G., 20:1699
Salih, N.A., ENDOR study of free radicals in X-irradiated glutarimide, 20:1392 (IA;PL)
Salladay, D.G., Solar concentration/destruction of pesticide rinsewater, 20:695 (R;US)
See Ash, D.H., 20:1775
Samanta, P.K., *See* Uryasev, S.P., 20:871
Samczynski, Z., *See* Danko, B., 20:1323
Samiel, M., Assistance to nuclear power user countries under the IAEA Technical Co-operation Programme, 20:2487 (RA;XA)
Sample, B.E., *See* Opresko, D.M., 20:457
Sampson, T.E., The FRAM code: Description and some comparisons with MGA, 20:1331 (R;US)
Sanchez, J.A., *See* Flesner, R.L., 20:291
Sander, O.R., *See* Yuan, V.W., 20:1588
Sandermann, H. Jr., Early biochemical effects of air pollutants: detection and possible significance for forest trees, 20:1964 (IA;DE)

Sandorfi, A.M., Few body physics with polarized photons, 20:2234 (R;US)
Sandoval, D.P., Noninterceptive transverse emittance measurement diagnostic for an 800 MeV H^- transport line, 20:1589 (R;US)
Sanford, T.W.L., Very high-power electron-beam transport in long gas cells from 10^{-3} to 10^3 Torr N_2, 20:1592 (R;US)
Sangariyavanich, A., Nondestructive neutron activation analysis of basalts, 20:1332 (R;TH;In Thai)
Sanger, M.J., Dynamic NMR studies of restricted arene rotation in the chromiu tricarbonyl thiophene and selenophene complexes, 20:1363 (R;US)
Sangsuriyan, J., *See* Poramatikul, N., 20:1416
Sano, Y., On the thermal characteristics of diesel particulate filter, 20:1070 (IA;JP;In Japanese)
Santer, B.D., *See* Hegerl, G.C., 20:1755
Santikijrungruang, C., *See* Pleehachinda, R., 20:1881
Santini, D.J., *See* Marr, W.W., 20:1073
Santopietro, R.D., *See* Harlan, R.A., 20:559
Sappok, M., *See* Kugeler, K., 20:784
Sarsour, H.N., *See* Turinsky, P.J., 20:801
Sasajima, Hideo, *See* Fuketa, Toyoshi, 20:817
Sasajima, Humio, *See* Arigane, Kenji, 20:862
Sasaki, Shunsaku, Age-dependence of susceptibility, 20:1927 (RA;JP;In Japanese)
Sasaki, T., *See* Miyata, H., 20:2170
Saterlie, S.F., *See* Buscheck, T.A., 20:320
Sathaye, J., *See* Sheinbaum, C., 20:1032
Sato, Fumiaki, *See* Otsu, Hiroshi, 20:1925
Sato, Isamu, *See* Yamaguchi, Seiya, 20:1576, 20:1577
Sato, Koichi, *See* Sawamura, Sadashi, 20:606
Sato, T., *See* Isobe, H., 20:1803
Satoh, Kazuyuki, The solid-state rf power amplifier for accelerator, 20:1582 (RA;JP;In Japanese)
Satoh, Kiyokazu, *See* Takeda, Osamu, 20:1559
Satterthwaite, B.C., *See* Kingsford, C.O., 20:452
Sattler, E., *See* Deimel, P., 20:1118
Sauers, I., Effect of a solid insulator on the spark yield of S_2F_{10} in SF_6*, 20:887 (R;US)
Sausedo, Eh., *See* Gorbar, Eh.V., 20:2094
Sauvage, D., *See* Basa, S., 20:1647
Savchenko, O.V., *See* Abazov, V.M., 20:1888
Savvides, N., *See* Foley, C.P., 20:2378
See Sloggett, G.J., 20:2383
See Yau, J., 20:2381
Sawada, Shozo, *See* Tauchi, Hiroshi, 20:1939
Sawamura, Sadashi, Monte Carlo calculation of electron beam dose distribution in water, 20:606 (RA;JP;In Japanese)
Sayers, D.E., Advanced growth and surface analysis system for in situ studies of interface formation: Annual technical report, 20:2312 (R;US)
Sazdjian, H., *See* Bawin, M., 20:2092
See Knecht, M., 20:2194
See Mourad, J., 20:2053
Scalef, C.C. III, Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)
Tank Monitor and Control System sensor acceptance test procedure: Revision 5, 20:372 (R;US)
Scardino, A.M.S., *See* Helene, O., 20:1799
Scaroni, A.W., *See* Jennings, P., 20:88
Schaaf, B. van der, *See* Borgstedt, H.U., 20:1113
Schaedel, M., Modeling a nielsbohrium (element 107) on-line gas phase separation procedure with rhenium, 20:1299 (R;DE)
Radiochemical search for neutron-rich isotopes of nielsbohrium in the $^{16}O + {}^{254}Es$ reaction, 20:2241 (R;DE)
Schaefer, L., An austenitic steel for fuel cladding tubes and core components of LMFBR's with high ductility after neutron irradiation, 20:1152 (R;DE;In German)
See Borgstedt, H.U., 20:1113
Schaefer, M., Effect of acid deposition on soil animals and microorganisms: influence on structures and processes, 20:1959 (IA;DE)
Schaffner, J., *See* Obertopp, T., 20:703
Schake, A.R., Magnetic separation for environmental remediation, 20:503 (R;US)
Schalla, R., Designing an enhanced groundwater sample collection system, 20:1831 (R;US)
Schapira, J.P., Transmutation of nuclear wastes: A working report to Nupecc, 20:284 (R;FR)
Scheby, J., *See* Madsen, G., 20:979
Schefer, R.W., Temporal evolution of turbulence/chemistry interactions in lifted, turbulent-jet flames, 20:1426 (R;US)
Scheibe, P., *See* Iske, U., 20:1362
Schellman, H., Nuclear A dependence of exclusive vector meson production in muon scattering, 20:2237 (R;US)
Schenewerk, P.A., Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Quarterly status report (final), April 1, 1994–June 31, 1994, 20:111 (R;US)
Schenkel, A., Improvement of a wet process for the separation of aerosols, 20:1762 (R;DE;In German)
Schermerhorn, D.S., Operability test report for the 300 Area Treated Effluent Disposal Facility, 20:343 (R;US)
Scherwinski, R., *See* Heinrich, M., 20:901
Schery, S.D., Transport of radon and thoron at the Earth's surface: Final report, April 1, 1988–June 30, 1994, 20:1706 (R;US)
Schetter, C., *See* Bett, A., 20:683
Schieber,, *See* Albrecht, H., 20:2144
Schieber, M., *See* Albrecht, H., 20:2146
Schier, W.A., Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994, 20:2276 (R;US)
Schieri, R., *See* Kreutzer, K., 20:1811
Schildknecht, D., *See* Bilenky, M., 20:2115
Schiller, P., *See* Borgstedt, H.U., 20:1113
Schimpf, E., *See* Schaedel, M., 20:1299
Schippers, S., *See* Meyer, F.W., 20:2347
Schirra, M., *See* Borgstedt, H.U., 20:1113
Schleisner, L., *See* Morthorst, P.E., 20:995
Schlereth, J., *See* Derrick, M., 20:2145
Schlueter, R., *See* Hoyer, E., 20:1591
See Humphries, D., 20:1604
Schmidlkofer, R.M., The speciality fertilizer market–scope and issues, 20:1844 (R;US)
Schmidt, F., How free is the research sector?: Lectures, 20:2451 (I;DE;In German)
Schmidt, F.A., *See* Ellis, T.W., 20:1144
Schmidt, G.L., *See* Polansky, G.F., 20:793
Schmidt, G.W., Nitrogen control of chloroplast differentiation, 20:1894 (R;US)
Schmidt, J.W., *See* Johnson, A.R., 20:469
Schmidtke, G., *See* Kist, R., 20:1664
Schmitt, R.L., *See* Henson, T.D., 20:1666
Schmitz, B., *See* Franz, K., 20:622
Schmoyer, R.L., *See* Watkins, D.R., 20:224
Schneider, A., Early detection of failures in internal combustion engines by analysing the angular velocity at the crankshaft, 20:1066 (I;DE;In German)
Schneider, R.P. Jr., *See* Lee, S.R., 20:1673
Schoeling, L.G., A model technology transfer program for independent operators: Kansas Technology Transfer Model (KTTM), 20:112 (R;US)
Schoeneman, J.L., *See* Johnson, C.S., 20:189
Schofield, T.G., *See* Filippone, C.L., 20:289
Scholz, F., Importance of the genetic structure in tree species for forest ecosystems under the influence of air pollutants, 20:1962 (IA;DE)
Schreiber, R.D., Tank 241-C-103 tank characterization plan, 20:421 (R;US)
Schrire, D., *See* Smith, G.P. Jr., 20:762
Schroeder, H., *See* Albrecht, H., 20:2144, 20:2146
Schubert, F., *See* Hahne, M., 20:1236
Schubert, L.E., Effect of neutron irradiation on the impact properties of A533B steel, 20:1162 (R;US)
Schubert, W., *See* Lu, C., 20:1727
Schuchmann, M.N., *See* Hildenbrand, K., 20:1388
Schuettauf, A., *See* Kunde, G.J., 20:2239
Schuler, M., *See* Malatidis, N.A., 20:704
Schultz, F.J., *See* Womble, P.C., 20:1293

Schultz, J.A., *See* Lin, Yuping, 20:1291
Schultz, L., *See* Holzapfel, B., 20:1207
Schulz, H.D., *See* Albrecht, H., 20:2144, 20:2146
Schulz, R., *See* Wolf, L., 20:785
Schulz, R.B., Cost-effective ceramics program in the United States, 20:1173 (R;US)
Schwartz, A.A., *See* Dunn, T.D., 20:778
Schwartz, M.M., The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993), 20:29 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 33: Quarterly technical status report for third quarter fiscal year 1993 (April 1–June 30, 1993), 20:30 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993), 20:31 (R;US)
Schwarz, H., RF system design for the PEP-II B Factory, 20:1610 (R;US)
See Neubauer, M., 20:1614
See Pendleton, R., 20:1613
Scott, S.D., *See* Zarnstorff, M.C., 20:2417
Sebek, J., *See* Corbett, J., 20:1608
Sedra, M.B., *See* Kadiri, A., 20:2052
See Saidi, E.H., 20:2038, 20:2039, 20:2040
Seetharamaiah, P., Away-from-reactor (AFR) storage concepts - The Indian experience, 20:200 (RA;XA)
Seguchi, Tadao, *See* Arigane, Kenji, 20:862
Seidel, K., *See* Worbs, M., 20:70
Seidel, M., The proton collimation system of HERA, 20:1601 (R;DE)
Seifert, W., *See* Kittler, M., 20:1114
Seiler, J.M., *See* Bede, M., 20:790
Seltz, R.R., Benchmarking of computer codes and approaches for modeling exposure scenarios, 20:239 (R;US)
See Wood, D.E., 20:238
Sekiba, T., *See* Takahashi, H., 20:1085
Sekine, K., *See* Isobe, H., 20:1803
Sekine, Kelichi, *See* Edis, R., 20:1802
Selkowitz, S.E., *See* Beltran, L.O., 20:1021
Sell, A., Assessing energy projects from the viewpoint of individual economic branches and total economy: The role of economic efficiency analysis, cost-benefit analysis and multicriteria methods, 20:910 (I;DE;In German)
Sellar, J.R., *See* Chen, Y., 20:1198, 20:1199
Semenov, V.A., *See* Belyaev, S.N., 20:2264
Semeraro, B.D., Solution of potential flow problems on a network of workstations, 20:2533 (R;US)
Semeshko, A., *See* Rolevitch, V., 20:837
Semones, G.B., Saltcrete formulation, 20:313 (R;US)
Seneviratne, J., *See* Devendra, R., 20:586
Sengupta, S., *See* Goretta, K.C., 20:1168
Senior, C.A., The importance of resolution on the response of mid-latitude transients to enhanced CO_2, 20:1733 (RA;US)
Senjanovic, G., Valencia 93: The summary of particle theory, 20:2086 (R;XA)
See Dvali, G., 20:2044
Sentis, R., On different models to deal with collisions between ionic and electronic populations, 20:2402 (R;FR;In French)
Seo, Toshihiro, *See* Edis, R., 20:1802
Sepehrnoori, K., *See* Pope, G.A., 20:95
Seright, R.S., Improved techniques for fluid diversion in oil recovery: Quarterly technical progress report, July 1, 1994–September 30, 1994, 20:114 (R;US)
Serio, M.A., *See* Solomon, P.R., 20:729
Serkiz, S.M., Uranium geochemistry in soil and groundwater at the F and H seepage basins, 20:271 (R;US)
Sessler, A.M., *See* Wei, Jie, 20:1527
Seth, K.K., Strong interactions studies with medium energy probes: Progress report, 1993–1994, 20:2079 (R;US)
Settles, R., Machine, physics and detector (plus final focus) interplay at the next e^+e^- linear collider, 20:1620 (RA;DE)
See Forty, R.W., 20:1618
Setzer, W.V., *See* Richterich, L.R., 20:1496
Seufert, G., Exclusion experiment for gaseous pollutants in spruces at Edelmannshof: concept and first element-budget data, 20:1810 (IA;DE;In German)
Seyama, Toshio, P53 in differentiation of thyroid cancer, 20:1932 (RA;JP;In Japanese)
See Ito, Takashi, 20:1931
Sezgen, A.O., Technology data characterizing lighting in commercial buildings: Application to end-use forecasting with commend 4.0, 20:991 (R;US)
Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0, 20:1020 (R;US)
Shaaban, H.I., *See* Abdelhalim, A.S., 20:146
Shaat, M.K., Nuclear reactor kinetics, 20:829 (IA;EG)
Shade, E.H., *See* Tingey, J.M., 20:309
Shagam, R.N., Light shaping diffusers™ improve aircraft inspection, 20:1033 (R;US)
Shah, A.N., *See* Johnson, A.R., 20:469
Shajii, A., Theory and modelling of quench in cable-in-conduit superconducting magnets, 20:2432 (R;US)
Shakhmuratova, L.N., The study of transient NMR effects by use of statistical tensor formalism, 20:2316 (IA;AU)
Shankle, S., *See* LaMontagne, J., 20:1013
Shapshak, M., A technique for calculating the field aligned conductance and ionospheric Pedersen conductivity from high altitude electric and magnetic field data, 20:2425 (R;SE)
Sharp, T.R., The North Carolina Field Test: Field performance of the preliminary version of an advanced weatherization audit for the Department of Energy's Weatherization Assistance Program, 20:1029 (R;US)
Sharps, P.R., Growth and development of GaInAsP for use in high-efficiency solar cells: Final subcontract report, 1 July 1991–30 December 1993, 20:689 (R;US)
Shaw, M.E., Criticality safety evaluation for TRU waste in storage at the RWMC, 20:496 (R;US)
Shaw, P., Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)
Shea, T., *See* Andrews, G., 20:260
Sheils, W., GaAs conduction bands observed by inverse photoemission spectroscopy, 20:2302 (IA;AU)
Sheinbaum, C., Transportation energy use in Mexico, 20:1032 (R;US)
Sheldon, B.W., The formation of reaction bonded Si_3N_4 at low temperatures and in short times, 20:1171 (R;US)
The nitridation of high purity, laser-synthesized silicon powder to form reaction bonded silicon nitride, 20:1170 (R;US)
Shen, Y.G., *See* Zhang, F.M., 20:1126
Sheng, J., *See* Derome, J., 20:1711
Shepard, R.L., *See* Booth, R.S., 20:882
Shepherd, T.G., Scaling of saturation amplitudes in baroclinic instability, 20:1734 (RA;US)
Shepodd, T.J., The permeation of bis(2-fluoro-2,2-dinitroethyl) formal (FEFO), ethyl 4,4-dinitropentanoate (EDNP), ethyl 4-nitropentanoate (ENP), and 1,2,4-trichlorobenzene (TCB) through barrier membranes, 20:1688 (R;US)
Sherrill, M.W., *See* Ulrich, G.B., 20:819
Sherwin, M.E., *See* Baca, A.G., 20:1505, 20:2307
Sherwood, D.J., *See* Johnson, G.D., 20:411
Shevchenok, A.A., *See* Rusanov, K.V., 20:1231
Shi, Zheng-Qiang, Carbon fiber reinforced superconductor composites: Final report, August 8, 1991–August 7, 1994, 20:1241 (R;US)
Shidara, Tetsuo, *See* Honma, Hiroyuki, 20:1572
Shie, R., *See* Shagam, R.N., 20:1033
Shieh, A.S., RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3, 20:877 (R;US)
Shields, J.T., U.S. fertilizer industry and the environment - from mine to farm, 20:1776 (R;US)
Shih, M., *See* Tittiranonda, P., 20:2564
Shina, Y., Heat transfer in the upper part of the HTTR pressure vessel during loss of forced cooling, 20:783 (RA;XA)
Shimada, Tsutomu, Continuously-tunable, narrow-linewidth, Q-switched Cr:LiSAF laser for lidar applications, 20:1765 (R;US)

Shinohara, Kibatsu, *See* Satoh, Kazuyuki, 20:1582
See Suzuki, Kunio, 20:1574
Shiomi, S., *See* Saegusa, T., 20:199
Shiragai, Akihiro, *See* Otsu, Hiroshi, 20:1925
Shirai, J., A light scalar top search by venus detector, 20:2174 (RA;JP)
Shirai, K., *See* Saegusa, T., 20:199
Shirai, M., *See* Miyata, H., 20:2170
Shirai, Nobuyuki, *See* Sakamoto, Mitsunori, 20:1566
Shirai, Toshiyuki, RF control of ICR proton linac, 20:1556 (RA;JP;In Japanese)
See Dewa, Hideki, 20:1560
Shoda, K., *See* Zubanov, D., 20:2275
Sholl, C.A., *See* Baker, J.B.H., 20:2315
See Stephenson, P.C.L., 20:2351
Shoop, K., *See* Kawatra, S.K., 20:68
Short, S.M., Descriptions of representative contaminated sites and facilities within the DOE complex, 20:511 (R;US)
Shpilrain, E.E., *See* Popel, S.O., 20:672
Shrivastava, H.P., Evaluation of near-field earthquake effects, 20:1456 (R;US)
Shroba, R.R., Preliminary surficial geologic map of the Rocky Flats Plant and vicinity, Jefferson and Boulder Counties, Colorado, 20:1840 (R;US)
Shul, R.J., Plasma-induced-damage of GaAs during etching of refractory metal contacts, 20:1287 (R;US)
See Baca, A.G., 20:1505, 20:2307
See Howard, A.J., 20:1507
Shulga, A.M., *See* Dzilinski, K., 20:1904
Shuryak, E., The theory of relativistic heavy ion collisions: [Annual] progress report, [July 1, 1993–June 30, 1994], 20:2236 (R;US)
Shutt, R.P., Gas cooled leads: This report consists of three independent parts, Part 1 covers the theory, Parts 2 and 3 present specific lead designs: Revision, 20:1542 (R;US)
Shvets, V.A., *See* Chasov, V.V., 20:1355
Siatecki, Z., *See* Chmielewski, P.J., 20:1352
Siddiqui, A.A., System for training and qualification of nuclear power plant personnel in Pakistan, 20:2480 (RA;XA)
Sidorenkov, S.S., *See* Evtushenko, I.A., 20:2429
Siebers, T., *See* Krabbe, N., 20:720
Siegmund, T., *See* Albrecht, H., 20:2146
Siekierski, S., *See* Borkowski, M., 20:1317
See Narbutt, J., 20:1318
Sienkiewicz, J., *See* Chmielewski, P.J., 20:1352
Sigurbjoernsson, B., Nuclear techniques in food and agriculture with special reference to environmental protection, 20:1905 (IA;PL)
Silady, F.A., *See* Dunn, T.D., 20:778
Silva, R.R. Jr., Advances in technology transfer at Federal Facilities, 20:937 (R;US)
Siman-Tov, M., FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results, 20:863 (R;US)
Simmonds, P.E., *See* Lerch, M.L.F., 20:2344
Simmons, C.S., *See* Epstein, M., 20:329
Simola, K., Ageing study of protection automation components of Olkiluoto nuclear power plant, 20:754 (R;FI;In Finnish)
Simon, G.P., *See* Luo, H.H., 20:1197
Simons, W.R., *See* Brooks, S.L., 20:1046
Simonson, J.M., *See* Moore, R.C., 20:1367
Simpson, B.C., *See* De Lorenzo, D.S., 20:418
See DiCenso, A.T., 20:394, 20:395
See Remund, K.M., 20:299, 20:300
Simpson, D.B., *See* Remund, K.M., 20:299
Sinclair, R., Application of quaternary phase diagrams to compound semiconductor processing, 20:1244 (R;US)
Singer, B., CASCAD dry storage concept for spent fuel, 20:196 (RA;XA)
Singh, C.P., Critical parameters of Quark-Hadron phase transition with interacting and massive quarks, 20:2085 (R;XA)
Singh, D., *See* Wagh, A.S., 20:219
Singjanusong, P., *See* Grudpan, K., 20:1308
Sipilae, A., *See* Korkka-Niemi, K., 20:1842
Siri-Upathum, C., Radiation vulcanization of natural rubber latex using N-butyl acrylate and carbon tetrachloride as sensitizer, 20:582 (IA;TH;In Thai)
Sirotin, A.P., *See* Rezaev, V.E., 20:1641
Sisakyan, A.N., *See* Kallies, W., 20:2000
Sitnik, I.M., Polarization phenomena in deuteron-proton backward elastic scattering, d + p -> p + d, 20:2258 (R;XJ)
Siyambalapitiya, D.J.T., Case Studies, 20:799 (I;LK)
Skarpaas, K., *See* Neubauer, M., 20:1614
Skinner, W.H., *See* Carson, R.D., 20:14
Skofronick, G.L., *See* Aumann, C.E., 20:1157
Skryabin, I., *See* Dligatch, S., 20:1275
Skryabin, I.L., In-situ control of solids oxidation, 20:2329 (IA;AU)
Slate, J.L., *See* Lindsey, K.A., 20:340
Slater, G.D., Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)
Slimane, R.B., *See* Hepworth, M.T., 20:15
Sloggett, G.J., Noise in high-T_c r.f. squids, 20:2383 (IA;AU)
See Foley, C.P., 20:2378
See Jenkins, B., 20:1185
Slomka, B.J., Deashing of coal liquids by sonically assisted filtration, 20:48 (R;US)
Separation of solids from coal liquefaction products using sonic waves, 20:49 (R;US)
Smadja, G., *See* Clergeau, J.F., 20:1653
Smallos, E., *See* Farvaque-Bera, A.M., 20:1153
Smallwood, D.O., Gunfire characterization and simulation using temporal moments, 20:1684 (R;US)
Smeltzer, E.E., *See* Newby, R.A., 20:9, 20:10
Smidt, H.D., Microbial growth in district heating pipes - preliminary investigation, 20:1061 (R;DK;In Danish)
Smidts, C., *See* Mosleh, A., 20:874
Smilga, A.V., On the spectral density of Euclidean Dirac operator in QCD, 20:2091 (R;FR)
Smirnov, A.Y., *See* Krastev, P.I., 20:2149
Smith, A.E., *See* Forsyth, A.G., 20:1991
Smith, A.M., *See* Rice, P., 20:269
Smith, D.B., Safeguards and Security Research and Development progress report, October 1992–September 1993, 20:557 (R;US)
Smith, D.J., *See* De Lorenzo, D.S., 20:418
Smith, D.L., *See* Chung, H.M., 20:1100
Smith, F.R., *See* Zawicki, L.R., 20:1500
Smith, G.A., The PROSAIC Laplace and Fourier Transform, 20:2532 (R;US)
Smith, G.B., *See* Dligatch, S., 20:1275
See Vagov, A.V., 20:2320
Smith, G.P. Jr., The evaluation and demonstration of methods for improved nuclear fuel utilization: Final report, 20:762 (R;US)
Smith, L.B., *See* Clark, D., 20:442
Smith, M.T., *See* Yuan, V.W., 20:1588
Smith, O.L., *See* Booth, R.S., 20:882
Smith, P., A process for establishing a financial assurance plan for LLW disposal facilities, 20:237 (R;US)
Smith, P.D., Automated Transportation Management System (ATMS) user's manual: Revision 1, 20:209 (R;US)
Smith, P.J., *See* Lupo, A.R., 20:1726
Smith, P.M., *See* Parmeter, J.E., 20:1163
Smith, P.V., *See* Dyson, A.J., 20:2325
See Radny, M.W., 20:1349
Smith, R.G., *See* Judkins, R.R., 20:1492
Smith, R.I., Planned mode of operation – PRTR chemical shim, 20:822 (R;US)
Smith, R.M., *See* Lewis, R.E., 20:1829
Smith, R.W., *See* Misra, M., 20:40
Smith, S.C., *See* Rai, D., 20:306
Smith, S.O., *See* Vargo, F.G. Jr., 20:1460
Smith, T.F., *See* Liu, M., 20:1130
Smolik, G.R., *See* McCarthy, K.A., 20:2434
Smoot, L.D., *See* Solomon, P.R., 20:729
Smyrl, N.R., *See* Powell, G.L., 20:1338
Snelgrove, J.L., *See* Wiencek, T.C., 20:839
Snelling, A.A., Alligator Rivers Analogue project - Geologic Setting: Final Report - Volume 2, 20:144 (I;AU)
Snellman, M., *See* Pitkaenen, P., 20:1861
Sobering, T.J., *See* Henson, T.D., 20:1666
Soboleva, T., *See* Buczkowski, M., 20:598

Sochanowicz, B., Metabolism of arachidonic acid in murine lymphoma L5178Y sublines radiation resistant of sensitive to ionizing radiation, 20:1923 (IA;PL)
Socolow, R.H., Exposure to radon and radon progeny in the indoor environment: Final report, 20:1707 (R;US)
Soelberg, N.R., Arc melter demonstration baseline test results, 20:268 (R;US)
See Oden, L.L., 20:264, 20:265
Soerensen, H., *See* Joergensen, O.B., 20:697
Soff, G., *See* Peshier, A., 20:2082
Sokol, P., *See* Gorenflo, D., 20:1473
Sokolov, M., *See* Keizman, Y., 20:658
Sokolowski, E., Development of nuclear power in Sweden, 20:965 (IA;PL)
The energy issue in Sweden. Can society handle technology poorly understood by its citizens?, 20:964 (IA;PL)
Soliman, H.M., Plasma focus matching conditions, 20:2401 (R;EG)
See Masoud, M.M., 20:2399, 20:2400
Sollacher, R., Effective field theories from QCD, 20:2083 (R;DE)
See Henning, P.A., 20:2207
Solodkaya, T.I., *See* Popov, V.V., 20:2343
Solodukhin, S.N., Exact solution of 2 D Poincare gravity coupled with fermion matter, 20:2097 (R;XJ)
Solomon, P.R., Fossil fuel conversion–measurement and modeling, 20:729 (R;US)
Solunin, S.A., *See* Burdanov, Ya.V., 20:2095, 20:2096
Sonder, E., Time-dependent, low-dose reporting limit for dosimeters that are taken home at the end of the workday, 20:1911 (R;US)
Sonnier, C.S., Safeguards equipment of the future integrated monitoring systems and remote monitoring, 20:560 (R;US)
The International Remote Monitoring Project and implications, 20:561 (R;US)
Sonntag, C. von, *See* Hildenbrand, K., 20:1388
Sonsuk, M., Carbon-14 in the marine environment of the gulf of Thailand, 20:1852 (IA;TH;In Thai)
Soodprasert, T., Radiation monitor calibration technique, 20:585 (IA;TH;In Thai)
See Wanitsuksombut, W., 20:584
Sopczak, A., Changed Higgs boson discovery potential at a 500 GeV e^+e^- linear collider, 20:2109 (RA;DE)
See Rosiek, J., 20:2106
Sorensen, K.W., *See* Brock, B.C., 20:1685
Sorge, J.N., 500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide emissions from coal-fired boilers, 20:80 (R;US)
Sornmani, S., The study of irradiated fish for prevention, 20:1903 (IA;TH)
Sornphorm, P., *See* Boonyawan, D., 20:1632
Sorrell, C.C., *See* Ramer, R., 20:1209
Sosenko, P.P., Fluctuations and electromagnetic wave scattering in macroscopically agitated plasma: effects of turbulent diffusion, 20:2415 (R;UA)
Fluctuations in macroscopically agitated plasma:quasiparticles and effective temperature, 20:2414 (R;UA)
Quasiparticles in magnetized plasma, 20:2416 (R;UA)
Sosnick, T.R., *See* Mitchell, R.D., 20:1869
Soucek, B., Spent fuel management and disposal programme (SFMDP) strategy for the Czech Republic, 20:193 (RA;XA)
Souka, N., Confinements systems in nuclear facilities other than nuclear reactors, 20:805 (R;EG)
Extraction of U, Th and gross gamma fission products by irradiated (HTTA-TBP) mixtures, 20:1377 (R;EG)
Radiolysis of tri-n-butyl phosphate solutions effect of absorbed dose on extractability of uranium fission products and nitric acid, 20:159 (R;EG)
Review of the main results of source terms studies under core melting conditions, 20:833 (R;EG)
Soumpasis, D.M., *See* Hummer, G., 20:1868
Sovierzoski, M.M.R., *See* Ricketts, B.W., 20:1273
Spalla, P., *See* Kartal, S., 20:2014
Spane, F.A., *See* Fruchter, J.S., 20:510
Spane, F.A. Jr., Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system, 20:307 (R;US)
Spang, W., *See* Frascaria, R., 20:2252
Spence, B., *See* Papadopoulos, G., 20:2067, 20:2068
Sphicas, P., *See* Aleksan, R., 20:2031
Spiewak, I., Methods of evaluating benefits of solar fuel and power production, 20:676 (IA;IL)
Spiller, P.J., Studies on the transport and on the focusing of intense, high-energetic heavy ion beams for the production of high energy density in matter, 20:1551 (R;DE)
Spinks, R.L., *See* Chastain, S.A., 20:348
Spirkl, W., *See* Usher, B.F., 20:2324
Spontarelli, T., *See* Flesner, R.L., 20:291
Sprehn, D., The design and performance of 150-MW S-band klystrons, 20:1594 (R;US)
Sproul, W.D., *See* Barnett, S.A., 20:1247
Squires, L., Mid-year financial plan, fiscal year 1954 process development, 20:842 (R;US)
Srinivasan, S., *See* Adzic, G.D., 20:895
Sriratchatchaval, V., The production of thermoluminescence dosemeter, $CaSO_4$(Dy), 20:1633 (IA;TH;In Thai)
Sriratprasit, N., *See* Sangariyavanich, A., 20:1332
Srisatit, S., Software program for a study and calculation of radiation, 20:2541 (IA;TH;In Thai)
Srisuksawat, K., *See* Yamkate, P., 20:1800
Srivastava, S.C., Production and supply of radioisotopes with high-energy particle accelerators current status and future directions, 20:580 (IA;JP)
Sriyotha, K., *See* Yamkate, P., 20:1800
Sriyotha, P., *See* Yamkate, P., 20:1800
Stachowicz, W., EPR spectroscopy as a tool for radiation exposure measurements on living animals in environment after nuclear contamination, 20:1402 (IA;PL)
Studies on the detection of radiation treated foodstuffs by the EPR spectroscopy, 20:1395 (IA;PL)
The EPR detectability levels in mollusc's shells exposed to the action of ionizing radiation, 20:1396 (IA;PL)
Stadelmann, P.A., *See* Bursill, L.A., 20:2345
Stadnik, P.E., *See* Malikov, V.Ya., 20:1227
Staehle, G., Arms control and nonproliferation technologies, third quarter 1994: Dismantlement transparency, 20:547 (R;US)
Stalb, F., *See* Kleib, H., 20:661
Stakebake, J.L., The ignitability potential of uranium "roaster oxide", 20:312 (R;US)
Staley, H.C., New technique for determining boundary dose from the Los Alamos Meson Physics Facility, 20:1767 (R;US)
Stampfer, J.F., Electrical-conductivity testing of latex gloves, 20:1487 (R;US)
Stanek, R., *See* Derrick, M., 20:2145
Stankowski, J., EPR in fullerenes, 20:1350 (IA;PL)
Staple, B.D., Risk impact of BWR technical specifications requirements during shutdown, 20:880 (R;US)
Staples, P., *See* Lisowski, P.W., 20:1587
Stapleton, G., *See* Baker, S., 20:1598
Starkov, V.V., *See* Akishin, P.G., 20:2543
Starodubov, Ya.D., *See* Aksenov, V.K., 20:1141
See Okovit, V.S., 20:1142, 20:1229
Staron, K., *See* Buraczewska, I., 20:1922
See Gradzka, I., 20:1921
Starosta, W., CEMS studies of phase transformation in the surface layer of SW12C steel after nitrogen implantation, 20:2358 (IA;PL)
Computer simulation of binary alloy structure in the Ising model scheme, 20:1139 (IA;PL)
Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content, 20:58 (IA;PL)
Starr, T.L., *See* Besmann, T.M., 20:725
Steadman, E.N., *See* Benson, S.A., 20:63
Steciak, J., *See* Levendis, Y.A., 20:739
Steele, E., *See* Davis, G., 20:562
Steele, J., *See* Peterson, M.E., 20:922
Steele, R., *See* Campbell, J.A., 20:302
Steeves, M.M., *See* Toma, L.S., 20:1110
Stefanova, I., Natural sorbents as barriers against migration of radionuclides from radioactive waste repositories, 20:282 (I;BG)
Stehn, J., *See* Carter, S., 20:140
Stein, S., *See* Peterson, M.E., 20:922

Stein, S.L., *See* Hagood, M.C., 20:1843
Stein, W., *See* Theden, U., 20:679
Steinberg, N., Nuclear energy in Ukraine. State and problems, 20:967 (IA;PL)
Steinhauer, L.C., *See* Kimura, W.D., 20:1514
Steinkamp, O., Measurement of the reaction anti pp→ΦΦ at the experiment JETSET, 20:2168 (R;DE;In German)
Stenehjem, E.J., Hanford technology integration: A success story, 20:933 (R;US)
Stepan, D.J., Sour gas plant subsurface remediation technology research and demonstration project: Quarterly technical progress report, January 1, 1994–March 31, 1994, 20:139 (R;US)
Stephan, A., *See* Kim, B.R., 20:2189
Stephens, R.H., *See* DiCenso, A.T., 20:395
Stephenson, D.A., *See* Henson, T.D., 20:1666
Stephenson, M., Advanced coal-fueled industrial cogeneration gas turbine system particle removal system development, 20:82 (R;US)
Stephenson, P.C.L., Tracer correlation factor and atomic displacements in solid state diffusion, 20:2351 (IA;AU)
Stepnewski, D.D., *See* Fox, G.L., 20:533
Sterba, H., Forest damage and incremental growth, 20:1955 (IA;DE;In German)
Sterlinska, E., *See* Chwastowska, J., 20:1325
Sterlinski, S., *See* Wasek, M., 20:1324
Stern, J., Light quark masses from exclusive tau decays: An experimental proposal, 20:2195 (R;FR)
See Knecht, M., 20:2166, 20:2194
See Smilga, A.V., 20:2091
Stevens, J.W., *See* Thomas, M.G., 20:694
Stevens, P.M., *See* Eggington, W.J., 20:120
Stewart, A.M., Classical lattice dynamics: Foreman-Lomer theory and the Blackman sum rule, 20:2019 (IA;AU)
Stewart, J.R., Report of material and equipment section's activities at New York Shipbuilding Corp. during fabrication of AXC 167 1/2 starting May 18, 1951: Part 9, Section 1 and 2, 20:868 (R;US)
Stieglitz, L., Formation and degradation mechanisms of polychlorodibenzodioxins, polychlorodibenzofurans and other organic pollutants produced in waste incineration processes: Final report, 20:1346 (I;DE;In German)
Stillman, A., Wavelet analysis and accelerator signals, 20:1546 (R;US)
Stine, W., Solar dish/Stirling technology, a world status report and comparison, 20:678 (IA;IL)
Uniform guidelines for reporting dish/Stirling solar electric system performance to permit comparison, 20:677 (IA;IL)
Stins, O.W.M., A retarding field energy analyser to measure the energy distributions of liquid metal ion sources, 20:1628 (R;DE)
Stinton, D.P., *See* Judkins, R.R., 20:1492
Stocchi, A., Production and lifetime measurements for B_s^0 with the LEP DELPHI detector, 20:2196 (R;FR;In French)
Stockton, G., Spectral cathodoluminescence studies in $YBa_2Cu_3O_{7-x}$ and its related components, 20:1212 (IA;AU)
Stohl, F.V., Evaluation of fine-particle catalysts: Activity testing results and phase identification using Mossbauer spectroscopy, 20:52 (R;US)
Stollov, M.N., Central extension of a new W_∞-type algebra, 20:2050 (R;XA)
Stone, P.H., The role of eddy transports in climate change, 20:1712 (RA;US)
Storch, H. von, *See* Hegerl, G.C., 20:1755
Storer, P., Electronic structure of graphite, diamond-like and graphitic amorphous carbon, 20:1259 (IA;AU)
See Vos, M., 20:1255
Storrow, J.K., *See* Forshaw, J.R., 20:2140
Stoto, T., *See* Courteille, C., 20:2418
Strain, B.R., Direct effects of atmospheric CO_2 enrichment on plants and ecosystems: An updated bibliographic data base, 20:1968 (R;US)
Stralt, R.S., *See* Davis, G., 20:562
Strand, T., *See* Kolstad, A.K., 20:1769
Stratmann, R., Development of an induction drift chamber for experiments at COSY and high-rate effects according to a new method, 20:1645 (R;DE;In German)
Strauss, M.G., Performance of the SLD CCD pixel vertex detector and design of an upgrade, 20:1656 (R;US)
Strayer, W.T., An object-oriented implementation of the Xpress Transfer Protocol, 20:2559 (R;US)
Street, G.H., *See* Marek, J.M., 20:540
Street, R., *See* Thompson, P.J., 20:2018
Strehlow, J.P., Structural analysis of color video camera installation on tank 241AW101 (2 Volumes), 20:380 (R;US)
Strel'tsov, V.N., *See* Khvastunov, M.S., 20:1975
Stretch, D., *See* Wiblin, W., 20:583
Strezov, A., *See* Milanov, M., 20:277
Strikland, N., *See* Jones, J., 20:2293
Stringer, J.B., Monitored retrievable storage facility conceptual design, 20:206 (RA;XA)
Strong, C., Intraseasonal oscillations and their predictability in a hemispheric barotropic model with seasonal forcing, 20:1735 (RA;US)
Stroup, J.L., *See* Lamberd, D.L., 20:360
Strugaru, D., Interaction of vanadium pentoxide with H-ZSM-5 zeolite investigated by EPR, 20:1357 (IA;PL)
Strzelecki, M., *See* Owczarczyk, A., 20:592
Stubler, W.F., *See* O'Hara, J.M., 20:830
Studd, W., *See* Walker, S.R., 20:2330
Studd, W.B., Carbon and oxygen analysis in MOCVD grown HgCdMnTe and AlGaAs by charged particle activation, 20:1313 (IA;AU)
Stuglik, Z., A therapy level α-alanine dosimetry, 20:1887 (IA;PL)
High-LET radiolysis. Pt.1. A facility and its testing, 20:1403 (IA;PL)
High-LET radiolysis. Pt.2. To "oxygen in heavy ion track hypothesis", 20:1404 (IA;PL)
High-LET radiolysis. Pt.3. Crystalline α-L-alanine irradiated on ^{12}C and ^{25}Mg ion beams, 20:1405 (IA;PL)
Stull, S., *See* Staehle, G., 20:547
Sturge, M.D., Excitons in semiconducting superlattices, quantum wells, and ternary alloys: Performance report, September 15, 1987–January 31, 1994, 20:1246 (R;US)
Su, Z.P., Resonant generation of nonequilibrium phonons in GaAs/AlAs quantum wells via intersubband scattering, 20:2306 (R;US)
Suciu, D.F., *See* Wikoff, P.M., 20:1042
Suemmerer, K., *See* Aumann, T., 20:2240
See Schaedel, M., 20:2241
Suhonen, E., *See* Anchishkin, D., 20:2218
Sujito, Quench recovery processes associated with defect behaviour in YBCO near the critical temperature, 20:1183 (IA;AU)
Thermoelectric power of YBCO: Ag composite superconductors, 20:2372 (IA;AU)
Sukjai, K., Development of a personal digital dosimeter, 20:1631 (I;TH;In Thai)
Sukontpradit, W., Labelling of meta-iodobenzylguanidine with iodine-131 (I-131-MIBG) for adrenal gland diagnosis, 20:1414 (I;TH;In Thai)
Sula, M.J., Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993, 20:298 (R;US)
Sullma, O., *See* Bett, A., 20:683
Sullivan, E.J., *See* Candy, J.V., 20:1675, 20:1974
Sullivan, J.M., *See* Edwards, R.E., 20:1036
See Pugh, K.C., 20:1372
See Salladay, D.G., 20:695
Sullivan, M., Multipole contribution from an off-axis orbit in an IR quadrupole and the consequences on the dynamic aperture, 20:1609 (R;US)
Sumitra, T., *See* Chantree, K., 20:1309
See Saisomboon, S., 20:1251
Sumiyoshi, Kohsuke, Relativistic mean field theory for unstable nuclei and its applications, 20:2055 (RA;JP;In Japanese)
Summers, L.J., *See* Farmer, J.C., 20:1004
Sumpter, B.G., *See* Getino, C., 20:2280
Sumption, M.D., *See* Liu, H.K., 20:1192
Sun Guangdi, Programme and experience on training and qualification for nuclear power plant personnel in China, 20:2469 (RA;XA)
Sun, D.Z., An EPV view of the zonal mean distribution of temperature and wind in the extra-tropical troposphere, 20:1736 (RA;US)
Character of electromechanical coupling in ceramic materials near F-AF phase boundary, 20:1181 (IA;AU)

Sun, H.B., Activation energy of oxygen deficient YBCO, 20:2373 (IA;AU)
Sun, X., *See* Bischof, C.H., 20:2528, 20:2529
Sungkhaburana, S., *See* Buapeng, S., 20:1900
Suomijaervi, T., The giant dipole resonance built on highly excited states: Results of the MEDEA experiment, 20:2209 (R;FR)
See Le Faou, J.H., 20:2212
Supalek, S., *See* Pleehachinda, R., 20:1881
Surano, K.A., *See* Harrach, R.J., 20:515
Sushkov, O.P., *See* Flambaum, V.V., 20:2366
See Kuchiev, M.Yu., 20:2369
Sutantawong, M., Effects of gamma radiation on fruit fly, Dacus zonatus (Saunders), 20:1901 (IA;TH;In Thai)
Suter, G.W. II, *See* Opresko, D.M., 20:457
Sutera, A., *See* Hansen, T., 20:1722
Sutherland, R.J., The role of DSM in a competitive market, 20:985 (R;US)
Sutherland, S.C., *See* Chipman, D.W., 20:1857
Suwanik, R., *See* Pleehachinda, R., 20:1881
See Tojinda, N., 20:1882
Suzudo, Tomoaki, Analysis of reactor power oscillation based on nonlinear dynamic theory, 20:749 (R;JP;In Japanese)
Suzuki, K., *See* Takada, S., 20:786
Suzuki, Katsumi, Sub-half-micrometer device fabrication with synchrotron based X-ray lithography, 20:2314 (IA;JP;In Japanese)
Suzuki, Kunio, Production and high power test of an S-band SLED with dual side-wall coupling irises, 20:1574 (RA;JP;In Japanese)
Svemar, C., *See* Baeckblom, G., 20:319
Swain, R.L., *See* McCabe, D.E., 20:1161
Swanberg, C.A., *See* Witcher, J.C., 20:710
Swanson, A.J., *See* Cronauer, D.C., 20:19, 20:20, 20:21, 20:23, 20:24, 20:25
Swett, K.J., *See* Lindsey, K.A., 20:340
Swierkowski, L., *See* Szymanski, J., 20:2367
Swinson, W.F., An examination of the elastic structural response of the Advanced Neutron Source fuel plates, 20:607 (R;US)
Symons, M.C.R., ESR studies of radiation damage of DNA and proteins, 20:1387 (IA;PL)
Synyakov, G.N., *See* Dzilinski, K., 20:1904
Szczepankiewicz, C., *See* Nowicki, A., 20:1360
Szeles, M.S.M.F., *See* Duarte, C.L., 20:1300
Szopa, Z., A trail of computer simulation of semiconductor detector gamma-ray spectra for detectability and precision prediction in instrumental neutron activation analysis, 20:1321 (IA;PL)
See Wasek, M., 20:1324
Szpilowski, S., Application of tracer method for selection of optimal location of industrial effluent outfall into the river, 20:593 (IA;PL)
See Owczarczyk, A., 20:592
Szucs, Z., *See* Miles, S., 20:1889
Szumiel, I., *See* Buraczewska, I., 20:1922
See Wojewodzka, M., 20:1919
Szyczewski, A., Influence of hydration of selected gadolinium β-diketonates on their EPR spectra, 20:1354 (IA;PL)
Szymanska-Buzar, T., *See* Wilgocki, M., 20:1356
Szymanski, J., Charge density wave and Wigner crystal instabilities in electron-hole systems, 20:2367 (IA;AU)
Szytula, A., *See* Leciejewicz, J., 20:1221

T

Tabak, M., *See* Ho, D.D.M., 20:2447
Tagawa, Seiichi, BEAM applications to polymer materials, 20:1378 (IA;JP;In Japanese)
Taha, H., *See* Fishman, B., 20:1822
Tajima, S., *See* Zhao, Y., 20:1260
Tajima, T., *See* Cable, S.B., 20:2406
See Yagi, M., 20:2405
Tajima, Toshiki, *See* Oliveira, S.R., 20:2009
Takacs, P.Z., *See* Church, E.L., 20:1428, 20:1541, 20:2308
Takada, S., Test apparatus of cooling panel system for MHTGR, 20:786 (RA;XA)
Takahashi, H., New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Takahashi, Hidetake, *See* Arigane, Kenji, 20:862
Takahashi, P., Travel to Japan for discussion on renewable energy projects: Foreign trip report, February 9–March 4, 1994, 20:614 (R;US)
Takahashi, T., *See* Chipman, D.W., 20:1857
See Obata, Y., 20:1930
Takami, A., Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)
Takamuku, K., *See* Gu, G.D., 20:1218
Takamura, K., *See* Miles, P.A., 20:2375
Takasaki, E., *See* Kawamura, M., 20:1571
Takeda, Osamu, Design and construction of the TIT RFQ, 20:1559 (RA;JP;In Japanese)
Takeda, Seishi, *See* Akemoto, Mitsuo, 20:1573
Takemoto, T., *See* Takami, A., 20:1086
Takenaka, T., *See* Kawamura, M., 20:1571
Takeuchi, Yasunao, Application of traveling-wave type RF window in L and S bands, 20:1579 (RA;JP;In Japanese)
Talaber, C., *See* Staehle, G., 20:547
Talaga, R.L., *See* Derrick, M., 20:2145
Tallon, J.L., *See* Williams, G.V.M., 20:2377
Tamaki, H., *See* Obata, Y., 20:1930
See Yamakawa, H., 20:1437
Tamargo, M.C., *See* Sturge, M.D., 20:1246
Tamisier, R., *See* Vernotte, J., 20:2245
Tamm, C.O., Critical loads for deposition of acid and nitrogen - do we know enough to make the concept useful?, 20:1813 (IA;DE)
Tanabe, Yoshio, *See* Takeda, Osamu, 20:1559
Tanaka, S., *See* Anderson, A.R., 20:1205
See Godamanne, G., 20:1203
Tang, Wai-Keung, Polarization of charmonium in πN collisions, 20:2182 (R;US)
Tang, Yu, Effect of gravitation on dynamic response of tanks containing two liquids, 20:220 (R;US)
Tangvarasittichai, O., *See* Tangvarasittichai, S., 20:1883
Tangvarasittichai, S., Application of radioactivity in clinical analysis by radioimmunoassay technique, 20:1883 (IA;TH;In Thai)
Tanida, Hiroaki, *See* Sawamura, Sadashi, 20:606
Taniuchi, H., *See* Tsuda, K., 20:1249
Tanner, B.K., *See* Usher, B.F., 20:2324
Tano, Shigemitsu, Perspectives of ion beam utilization on plant gene analysis, 20:1917 (IA;JP;In Japanese)
Tanooka, Hiroshi, *See* Ootsuyama, Akira, 20:1926
Tanos, G., *See* Ediriweera, R.N., 20:1274
Tansley, T.L., *See* Kumar, S., 20:1215
See Osotchan, T., 20:2393
Tantawi, S.G., Mode selective directional coupler for NLC, 20:1595 (R;US)
Tantisatayaraki, W., *See* Dharmavanij, W., 20:611
Tantisatayaraks, W., *See* Dharmavanij, W., 20:610
Tapanes, E., Cure monitoring with fibre optic sensors, 20:1258 (IA;AU)
Fibre optic chemical sensors, 20:1661 (IA;AU)
Tarasov, V.E., Dissipative quantum mechanics: The generalization of the canonical quantization and von Neumann equation, 20:1989 (R;XA)
Tariq, Jamil A., *See* Wiblin, W., 20:583
Tassinari, C.C.G., *See* Barreto, P.M.C., 20:143
Tatar, N., *See* Kirane, M., 20:1977
Tatchyn, R., Prospects for high power Linac Coherent Light Source (LCLS) development in the 1000Å – 1Å wavelength range, 20:1526 (R;US)
Tate, P.J., *See* Harrach, R.J., 20:515
Tauchi, Hiroshi, Suppression of radiation-induced in vitro carcinogenesis by ascorbic acid, 20:1939 (RA;JP;In Japanese)
Taulbee, D., *See* Carter, S., 20:140
Tayloe, R.W. Jr., *See* Negron, S.B., 20:151
Taylor, G., ICRF heating of deuterium-tritium plasmas in TFTR, 20:2422 (R;US)
Taylor, K.A., Radioactive waste management information for 1993 and record-to-date, 20:234 (R;US)
Taylor, K.N.R., *See* Gamchi, H.S., 20:1202
See Hartman, A., 20:2395
See Miles, P.A., 20:2375

Tedeschi, D.J., Work plan for 105KE Basin seal conveyor relocation, 20:350 (R;US)
Temkin, R., Travel to Germany for a meeting of the ITER Joint Central Team: Foreign trip report, October 19–28, 1993, 20:2407 (R;US)
Tennant, D., Training of nuclear power plant personnel in Canada, 20:2497 (RA;XA)
Tentyukov, M.N., Wormhole on the Lobachevsky background, 20:1976 (R;XJ)
Teotia, A.P.S., *See* Poyer, D.A., 20:997
Teplitskaya, T.S., *See* Dejneka, T.G., 20:1225
Ter-Akopyan, G.M., *See* Andreev, A.N., 20:2265
Ter-Grigoryan, S.A., *See* Topchiashvili, M.I., 20:1279
Termignone, G., *See* Oliva, C., 20:1351
Ternes, M.P., *See* Levins, W.P., 20:1030
Teryaev, O., *See* Efremov, A., 20:2087
Tesmer, J.R., *See* Jervis, T.R., 20:1158
See Yu, N., 20:1237
Tessmer, R.G. Jr., Project considerations and design of systems for wheeling cogenerated power, 20:1040 (R;US)
Teubner, T., *See* Jezabek, M., 20:2076, 20:2127
Teuchert, E., Distribution of the decay heat in various modul HTRs and influence on peak fuel temperatures, 20:774 (RA;XA)
Teufel, L.W., *See* Holcomb, D.J., 20:123
Thakur, J.S., The freezing of 2D electron liquid in a random potential, 20:1129 (IA;AU)
Thamthari, P., *See* Wiblin, W., 20:583
Thayer, K.J., Physics Division annual report, April 1, 1993–March 31, 1994, 20:2201 (R;US)
Theden, U., Solar thermal activities in Australia: An overview, 20:679 (IA;IL)
Thellier, G., *See* Carcreff, H., 20:741
Therdthianwong, A., *See* Gidaspow, D., 20:87
Thibaud-Erkey, C., *See* Klavetter, E.A., 20:317
Thiele, B., Measurement of two velocity components in the vicinity of the wall of a turbulent fluid flow by means of a Laser-Doppler-Anemometer submerged into the fluid, 20:1467 (I;DE;In German)
Thiele, V., *See* Prinz, B., 20:1809
Thiercelin, C., *See* Joly, C., 20:823
Thiesen, T., *See* Andrews, G., 20:260
Thimmapuram, P.R., *See* Doctor, R.D., 20:59
Thoelke, J.B., Magnetization and magnetostriction in highly magnetostrictive materials, 20:1145 (R;US)
Thoma, D.J., *See* Lewis, G.K., 20:1155
Thomas, J.M., Technical basis for beta skin dose calculations at the Y-12 Plant, 20:1947 (R;US)
Thomas, M.G., Highlights of recent balance of system research and evaluation, 20:694 (R;US)
Thomas, R., The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2468 (RA;XA)
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2498 (RA;XA)
Thomasius, H., Conservation and reconstruction of forests in the medium-range mountains of the German Democratic Republic under the impact of nuisances, 20:1815 (IA;DE;In German)
Thombley, R.L., *See* Lennon, W.J., 20:2565
Thomlinson, W., Transvenous coronary angiography in humans with synchrotron radiation, 20:1872 (R;US)
Thompson, G., *See* Blau, M., 20:2036
Thompson, M.N., *See* Zubanov, D., 20:2275
Thompson, P.J., Self-organized criticality in magnetization reversal, 20:2018 (IA;AU)
Thomson, M.J., Can we test the many-Hilbert-space approach to quantum mechanics?, 20:2005 (R;AU)
Thomspon, G., *See* Hussain, F., 20:2084
Thongmitr, W., *See* Soodprasert, T., 20:585
See Wanitsuksombut, W., 20:584
Thongphasuk, J., The effects of gamma irradiation on blood and its components, 20:1899 (IA;TH)
Thongyoi, C., Radioiodination of testosterone 3-(0-carboxylmethyl) hydroxylamine tyrosine methyl ester, 20:1415 (I;TH;In Thai)
See Poramatikul, N., 20:1416
Thornton, E.C., Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)
Thron, J., *See* Derrick, M., 20:2145
Thunborg, S., A review of technology for contact protection of remediation manipulators (WHC Issue 39), 20:513 (R;US)
Tian, S., *See* Adewumi, M.A., 20:128
Tibaldi, S., *See* Tosi, E., 20:1738
Tibballs, J., *See* Lim, M., 20:1125
Tidwell, S.C., *See* Kimura, W.D., 20:1514
Tidwell, V.C., Laboratory investigation of constitutive property scaling behavior, 20:105 (R;US)
Tiee, J.J., *See* Shimada, Tsutomu, 20:1765
Tierney, J.W., Low severity upgrading of F-T waxes with solid superacids: Quarterly report, 1 June 1994–31 August 1994, 20:34 (R;US)
Tighe, R., RF feedback simulation for the PEP-II B Factory, 20:1593 (R;US)
See Corredoura, P., 20:1611
Tikhinskij, G.F., *See* Matsakova, A.A., 20:1224
See Tret'yakov, V.M., 20:1226
Tikhonovskij, M.A., Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
See Matsakova, A.A., 20:1224, 20:1228
See Tortika, A.S., 20:1230
Timan, B.L., *See* Malikov, V.Ya., 20:1227
Timoschenko, T.N., *See* Korzhik, M.V., 20:1282
Ting, M., Maintenance of extratropical low-frequency variabilities in the atmosphere, 20:1737 (RA;US)
Tingey, J.M., The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)
See Remund, K.M., 20:299, 20:300
Tingle, A.R., Field demonstration of rapid turnaround, multilevel groundwater screening, 20:1821 (R;US)
Tishin, A.V., *See* Rezaev, V.E., 20:1641
Tisserant, S., *See* Basa, S., 20:1647
Tittiranonda, P., Ergonomic evaluation of the Apple Adjustable Keyboard, 20:2564 (R;US)
Titzler, P.A., *See* Moore, T.L., 20:531
Tkabladze, A., *See* Jikia, G., 20:2141
Tkatchenko, A., *See* Leleux, G., 20:1518, 20:1519
Tobin, J.G., *See* Waddill, G.D., 20:2342
Todesco, E., *See* Bazzani, A., 20:1531
Tojinda, N., TSH IRMA of dried blood spots, 20:1882 (IA;TH;In Thai)
See Pleehachinda, R., 20:1881
Tolt, T.L., *See* Schake, A.R., 20:503
Toma, L.S., Incology alloy 908 data handbook, 20:1110 (R;US)
Tomic, B., Training related activities, 20:2494 (RA;XA)
Tomich, S., *See* Hagood, M.C., 20:1843
Tomimasu, Takio, *See* Morii, Yasutsugu, 20:1565
Tomio, L., *See* Dey, J., 20:2088
Tomlinson, M.J., *See* Hollenberg, L.C.L., 20:2074
Tong, S.Y., *See* Waddill, G.D., 20:2342
Tonn, B., IRP and the electricity industry of the future: Workshop results, 20:994 (R;US)
Methodologies for estimating one-time hazardous waste generation for capacity generation for capacity assurance planning, 20:1826 (R;US)
Tonn, B.E., National Information Infrastructure Education Forum: A summary report, 20:930 (R;US)
Topchiashvili, M.I., Investigation of thermal conductivity in polymer-ceramic HTSC composites., 20:1279 (IA;UA;In Russian)
Toppan, F., Generalized NLS hierarchies from rational W algebras, 20:2064 (R;FR)
Toran, L.E., *See* Gwo, J.P., 20:295
Tortika, A.S., ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
See Tikhonovskij, M.A., 20:1223
Tosatti, E., *See* Martonak, R., 20:2361
Tosi, E., Predictability of blocking, 20:1738 (RA;US)
Tossavainen, K., Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1993 and annual summary, 20:751 (R;FI)
Toth, J.J., *See* Remund, K.M., 20:299, 20:300

Townsend, Y.E., *See* Black, S.C., 20:241, 20:453
Toyama, S., *See* Hirano, K., 20:1578
Trakhtenberg, L.I., *See* Grigoryev, E.I., 20:1389
Trampus, P., *See* Jambrich, I., 20:2502
Tran, T.T., *See* DiCenso, A.T., 20:394
Trautmann, Ch., *See* Ciesla, K., 20:2357
Treat, R.L., Feasibility study of tank leakage mitigation using subsurface barriers, 20:529 (R;US)
Treiner, J., *See* Pricaupenko, L., 20:2396
Trenkler, T., *See* Treat, R.L., 20:529
Trent, S.J., *See* Hagood, M.C., 20:1843
Tret'yakov, V.M., About influence of silver additions on superconducting properties of the HTSC ceramic, 20:1226 (IA;UA;In Russian)
Trewhella, J., *See* Mitchell, R.D., 20:1869
Trif, E., *See* Strugaru, D., 20:1357
Trkov, A., *See* Ravnik, M., 20:204
Trucano, T., Computational design of hypervelocity launchers, 20:1444 (R;US)
Trudell, D., *See* Klavetter, E.A., 20:317
Truitt, R.W., Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1), 20:402 (R;US)
See McClees, J., 20:426
See McNeece, S.G., 20:378
Trujillo, A.G., *See* Stampfer, J.F., 20:1487
Trujillo, L.T., *See* Vargo, F.G. Jr., 20:1460
Trujillo, T.C., *See* Quagliano, J.R., 20:1503
Tsakmakis, C., *See* Laemmer, H., 20:809
Tsibulskij, V.F., *See* Mosevitskij, I.S., 20:782
Tsookhuu, Kh., *See* Korenman, G.Ya., 20:2290, 20:2291
Tsotsis, T.T., Hindered diffusion of coal liquids: Quarterly report No. 7, March 18, 1994–June 17, 1994, 20:57 (R;US)
Tsuda, K., Development of highly effective neutron shields and neutron absorbing materials, 20:1249 (IA;JP)
Tuerler, D., *See* Griffith, B., 20:1026
Tugal, V.V., A superfield generalization of the classical action-at-a-distance theory, 20:2047 (R;XA)
Tullborg, E.L., *See* Larsson, S.Aa., 20:1837
Turchetti, G., *See* Bazzani, A., 20:1531
Turinsky, P.J., NESTLE: Few-group neutron diffusion equation solver utilizing the nodal expansion method for eigenvalue, adjoint, fixed-source steady-state and transient problems, 20:801 (R;US)
See Penland, R.C., 20:2277
Turner, M., Spent fuel management in the Slovak Republic, 20:203 (RA;XA)
Turner, P.C., *See* Oden, L.L., 20:264, 20:265
See Soelberg, N.R., 20:268
Tuttle, B.G., *See* Richterich, L.R., 20:1496
Tveter, T.S., *See* Guttormsen, M., 20:2274
Tyler, N., Revitalizing a mature oil play: Strategies for finding and producing unrecovered oil in Frio Fluvial-Deltaic reservoirs of South Texas: Technical progress report, July 1, 1994–September 30, 1994, 20:99 (R;US)
Tyminski, B., *See* Chmielewski, A.G., 20:599
Tyner, C.E., *See* Burch, G.D., 20:701
Tyurina, E.G., *See* Rusanov, K.V., 20:1231
See Topchiashvili, M.I., 20:1279

U

Udomsomporn, S., *See* Wanitsuksombut, W., 20:584
Udovich, C.A., *See* Balachandran, U., 20:134
Udyanskij, Yu.N., *See* Mosevitskij, I.S., 20:782
Ueda, Tamotsu, Two-nucleon and meson-two-nucleon systems at intermediate energies, 20:2167 (RA;JP)
Uehara, K., *See* Zhao, Y., 20:1260
Ueno, Akira, Low power RF field tuning of a four-vane type RFQ for the JHP, 20:1558 (RA;JP;In Japanese)
See Yoshino, Kazuo, 20:1561
Ulk, P.F., Engineering drawing field verification program: Revision 3, 20:423 (R;US)
Ullmann, J.L., *See* Lisowski, P.W., 20:1587
Ullmo, D., Coding chaotic billiards. Pt. 3: Non-tiling billiards defined on the pseudosphere, 20:1995 (R;FR)
Orbital magnetism in ensembles of ballistic billiards, 20:2024 (R;FR)
See Giannoni, M.J., 20:1994
Ulrich, B., Forest decline in ecosystem perspective, 20:1953 (IA;DE)
International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings, 20:1950 (I;DE;In German, English)
International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings, 20:1952 (I;DE;In German, English)
Ulrich, G.B., Clad vent set cup open end (closure weld zone) wall-thickness study, 20:819 (R;US)
Unamba Oparah, I., *See* Mbagwu, J.S.C., 20:1797
Underwood, J.A., *See* Hauth, J.T., 20:549
Unsworth, J., *See* Ediriweera, R.N., 20:1267, 20:1274
See Pillai, S.M., 20:1254
Upadhyaya, B.R., *See* Booth, R.S., 20:882
Urbainczyk, W., Reduction of health-affecting ultra-fine dusts by automatically controlled water addition during the application of dry construction materials. Main phase: Final report, 20:77 (I;DE;In German)
Urbanski, P., *See* Kowalska, E., 20:1316
Urie, M.W., *See* King, A.G., 20:1333
Uryasev, S.P., Issues and approaches in risk-based aging analyses of passive components, 20:871 (R;US)
Usher, B.F., Lattice relaxation in stained layer semiconductors studied by in situ X-ray topography during MBE growth, 20:2324 (IA;AU)
Utsuyama, M., *See* Hirokawa, K., 20:1936
Uzhinskij, V.V., *See* El-Waged, Kh., 20:2231, 20:2232

V

Vachev, B., Research procedure and criteria for analysis and choice of variants for construction of national radioactive waste repository, 20:278 (I;BG)
See Evstatiev, D., 20:279
Vagov, A.V., A practical application of the theory of hyper-complex variables: dielectric and optical response of 3-dimensional arrays of spheres of complex permittivity, 20:2320 (IA;AU)
Vaknin, D., *See* Wang, X.L., 20:1174
Valdes, P.J., *See* Hall, N.M.J., 20:1721
Valdez, J.G., *See* Cobo, J.M., 20:1967
Valentin, J., Radiation in everyday life, 20:961 (I;XA)
Valentini, J.J., Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)
Valenzuela, B.D., Tank characterization report for Single-Shell Tank 241-T-107, 20:396 (R;US)
Valero, O.J., 1994 Solid waste forecast summary: Waste characteristics and treatability groups, 20:327 (R;US)
Valocchi, A.J., *See* Rittman, B.E., 20:1780
van Asselt, W.K., Instrumentation for on-line mountain range displays, 20:1543 (R;US)
van der Geer, B., Wavelength and power stability measurements of the Stanford SCA/FEL, 20:1524 (R;US)
van der Hoeven, B.J., *See* Crider, S.A., 20:2516
Van Dyke, J.W, *See* Barnes, P.R., 20:885
Van Hook, A., *See* Chmielewski, A.G., 20:1320
Van Pelt, R., *See* Evans, C.S., 20:474, 20:542
Vance, E.R., Charge compensation mechanisms for aliovalent impurities in perovskite and zirconolite, 20:1213 (IA;AU)
See Ball, C.J., 20:1191
Vanden Heuvel, L.N., Precursors to potential severe core damage accidents: 1993, A status report: Volume 19: Main report and appendices A–D, 20:875 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 20: Appendices E and F, 20:876 (R;US)
Vander Velde, C., *See* Becker, R., 20:2137
VanDevender, J.P., *See* Berman, M., 20:1050
VanSant, J.H., *See* Chen, T.F., 20:1250
Vanttola, T., *See* Reiman, L., 20:2515

Vapirev, E., A review of the technology and experience of spent nuclear fuel storage. Alternatives for the problem of spent fuel in Bulgaria, 20:280 (I;BG)
Vargo, F.G. Jr., System design description for mini-dacs data acquisition and control system, 20:1460 (R;US)
Vargo, G.F. Jr., System configuration management plan for 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System, 20:377 (R;US)
Varpasuo, P., Seismic design and analysis methods, 20:764 (R;FI;In Finnish)
Vartuli, C.R., *See* Shul, R.J., 20:1287
Vasaros, L., *See* Miles, S., 20:1889
Vasil'ev, O.V., *See* Belyaev, S.N., 20:2264
Vasiljeva, I., *See* Rolevitch, V., 20:837
Vassallo, A.M., *See* Hall, L.E., 20:1263
Vaughn, M.E., *See* Liekhus, K.J., 20:256
Vautherin, D., Many-body methods at finite temperature, 20:2213 (R;FR)
See Martin, C., 20:2093
Vawter, G.A., Unlimited-bandwidth distributed optical phase modulators and detectors: Design and fabrication issues, 20:1668 (R;US)
Vdovin, A.I., One-phonon excitations in hot nuclei, 20:2220 (R;XJ;In Russian)
Vego, A., *See* Carter, S., 20:140
Vejsig Pedersen, P., *See* Balslev-Olesen, O., 20:699
Vella, M.C., *See* Kwan, J.W., 20:1890
Venhuizen, J.R., INEL BNCT Research Program Annual Report 1993, 20:1874 (R;US)
Venturi, A., Experimental aspects of rare top quark decays at future e^+e^- linear colliders, 20:2123 (RA;DE)
Ver Steeg, H.W., *See* Reeves, R.J., 20:2332
Verbus, V.A., *See* Protogenov, A.P., 20:2390
Verkhorobin, L.F., *See* Matsakova, A.A., 20:1224, 20:1228
See Tikhonovskij, M.A., 20:1223
See Tortika, A.S., 20:1230
Vermeul, V.R., *See* Spane, F.A. Jr., 20:307
Vernotte, J., $^{29}Si(d,^3He)^{28}Al$ reaction at 29 MeV, 20:2250 (R;FR)
Spectroscopic factors from one-proton stripping reactions on sd-shell nuclei: Experimental measurements and shell model calculations, 20:2245 (R;FR)
Verzegnassi, C., *See* Layssac, J., 20:2133
Vesely, W.E., *See* Uryasev, S.P., 20:871
Vesikari, E., The protection and inspection of prestressing tendons in containment structures of nuclear power plants, 20:752 (R;FI;In Finnish)
Vicente Manzi, A., Atucha 1 Nuclear Power Station, 20:2464 (RA;XA)
Vickers, R.E.M., *See* Baker, R.J., 20:2285
Vieira, D., Parity nonconservation in radioactive atoms: An experimental perspective, 20:2295 (R;US)
Vilaithong, T., *See* Boonyawan, D., 20:1632
See Godfrey, L., 20:1634
Vinh Mau, R., *See* Cottingham, W.N., 20:2020
Vinitskij, S.I., *See* Akishin, P.G., 20:2543
Vishniakov, A.V., *See* Oliva, C., 20:1351
Vitek, J.M., Computational modeling of diffusion-controlled transformations in ternary systems, 20:1106 (R;US)
Vitek, S.A., *See* Vitek, J.M., 20:1106
Vodney, E.P., Financial services FY 1995 site support program plan WBS 6.10.4, 20:2518 (R;US)
Vogg, H., *See* Stieglitz, L., 20:1346
Volkas, R.R., *See* Levin, Y., 20:2183
Volod'ko, A.G., The track system of the modernized 'Hyperon' spectrometer, 20:1642 (R;XJ;In Russian)
Von Bargen, B.H., 242-A Evaporator/Liquid Effluent Retention Facility data quality objectives, 20:383 (R;US)
von Winterfeldt, D., *See* Armacost, L.L., 20:301
Voronov, V.V., *See* Belyaev, S.N., 20:2264
Vos, M., (e, 2e) measurements of thin graphite film, 20:1255 (IA;AU)
Vos, Maarten, *See* Storer, P., 20:1259
Voss, S.S., *See* Polansky, G.F., 20:793
Vourvopoulos, G., *See* Womble, P.C., 20:1293
Vuori, M., *See* Nissilae, M., 20:1450
Vuorinen, U., *See* Pitkaenen, P., 20:1861
Vybyvanets, V., *See* Hoth, C.W,, 20:791

W

Waddill, G.D., Magnetic x-ray circular dichroism in spin-polarized photoelectron diffraction, 20:2342 (R;US)
Waechter, D.A., *See* Staley, H.C., 20:1767
Wagh, A.S., Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)
Wagner, R.A., *See* Hingerty, B.E., 20:1948
Wahl, K., *See* Campbell, J.A., 20:302
Wahlstroem, B., Nuclear power in Finland. Present status and trends, 20:969 (IA;PL)
Waite, D., *See* Edis, R., 20:1802
Walbeck, M., *See* Hake, J.F., 20:918
Wald, K.R., *See* Su, Z.P., 20:2306
Walicka, M., *See* Wojewodzka, M., 20:1919
Waligorski, M.P.R., Track structure analysis of survival of two mouse lymphoma L5178Y cell strains of different radiation sensitivity, 20:1920 (IA;PL)
Walis, L., *See* Chmielewski, A.G., 20:590
See Ciurapinski, A., 20:1484, 20:1485
See Lukasiewicz, A., 20:1361
See Panczyk, E., 20:1314
See Rowinska, L., 20:597
Walker, E.W. Jr., A modular dexterous robot for glove box applications, 20:1461 (R;US)
Walker, S., *See* Hyde, R.A., 20:498
Walker, S.R., Analysis of compound semiconductor materials using heavy ion recoil spectrometry, 20:2330 (IA;AU)
See Studd, W.B., 20:1313
Walling, L., Impedance measurements of the LEB extraction kicker magnet, 20:1600 (R;US)
Walsh, A.C., *See* Brevick, C.H., 20:385, 20:386, 20:389, 20:390, 20:391
Walsh, D.A., *See* Mitchell, R.D., 20:1869
Walter, E.J., B Plant low level waste system integrity assessment plan, 20:425 (R;US)
Walter, M., *See* Albrecht, H., 20:2144, 20:2146
Walters, M.F., *See* Treat, R.L., 20:529
Walukiewicz, W., *See* Chen, A.L., 20:1283
See Moll, A.J., 20:1284
Wanabongse, P., Enhancement of peak searching capability in nuclear spectrometry, 20:2540 (IA;TH;In Thai)
Wander, J., *See* Phillips, C.A., 20:626
Wanderer, P., Technology transfer for industrial production of superconducting magnets for the RHIC project at BNL, 20:1544 (R;US)
Wandinger, U., Theoretical and experimental studies for the measurement of stratospheric aerosols and the influence of multiple backscattering on the cloud measurement with a polarization Raman lidar, 20:1746 (R;DE;In German)
Wang Wen-zheng, Dynamic Jahn-Teller-induced infrared absorption of a charged C^-_{60} molecule, 20:2297 (R;XA)
Wang, D., *See* Hildenbrand, K., 20:1388
Wang, G., *See* Campbell, S.J., 20:2318
Wang, H.F., Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas, 20:1495 (R;US)
Wang, J., *See* Miles, P.A., 20:2375
Wang, J.X., *See* Ocko, B.M., 20:2309
Wang, M.Q., *See* Marr, W.W., 20:1073
Wang, X.L., Neutron diffraction study of the magnetic ordering of $BaCuO_{2+x}$, 20:1174 (R;US)
Wang, Y.L., *See* Sun, D.Z., 20:1181
Wang, Z., *See* Sayers, D.E., 20:2312
Wang, Z.R., *See* Wang, X.L., 20:1174
Wanitsuksombut, W., Standardization in beta dosimetry, 20:584 (IA;TH;In Thai)
See Soodprasert, T., 20:585
Wannamaker, P.E., Tensor controlled-source audiomagnetotelluric survey over the Sulphur Springs Thermal area, Valles Caldera, New Mexico, U.S.A.; Implication for structure of the western Caldera and for CSAMT methodology, 20:1779 (R;US)
Warchol, S., *See* Rzewuski, H., 20:2356

Ward, J.J., *See* Miller, D.J., 20:1619
Warminski, T., *See* Duncan, A., 20:2286
Warpinski, N.R., *See* Holcomb, D.J., 20:123
Warren, J.F., *See* Kiser, D.M., 20:1077
Was, G.S., Feasibility of a novel approach for fast, economical determination of radiation damage in nuclear reactor cores: Progress report, [November 1, 1993–October 31, 1994], 20:807 (R;US)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)
Wasek, M., The elaboration of the method of phosphorus and potassium determination in plant materials with the use of 14 MeV neutron generator in the new constructed laboratory dedicated for nitrogen determinations, 20:1324 (IA;PL)
Washburn, F., *See* Evans, C.S., 20:474, 20:542
Wasiolek, P., *See* Schery, S.D., 20:1706
Wasowicz, T., *See* Burlinska, G., 20:1394
See Lukasiewicz, A., 20:1361
See Michalik, J., 20:1382, 20:1398
See Pogocki, D., 20:1393, 20:1397
Watanabe, Y., *See* Pin, F.G., 20:1038
Watarumi, Chikae, Neutron therapy and medical therapy reactor, 20:1879 (IA;JP;In Japanese)
Waters, L., *See* Lisowski, P.W., 20:1587
Watkins, D.R., Oak Ridge background soils project provides data for remedial action evaluation, 20:224 (R;US)
Watrous, R.A., *See* Anantatmula, R.P., 20:323
Watson, D.J., The history and legacy of Project X, 20:522 (R;US)
Watson, R.W., The National Storage Laboratory: Overview and status, 20:2560 (R;US)
See Adewumi, M.A., 20:128
Watson, S.A., A cryogenic dose calorimeter for pulsed radiographic accelerators, 20:1651 (R;US)
Watthanachai, N., *See* Sonsuk, M., 20:1852
Webb, B.J., *See* Wootan, D.W., 20:397
Webb, B.W., *See* Queiroz, M., 20:89
Weber, F., Properties of strange-matter stars, 20:2025 (R;US)
Weber, H., *See* Maass, K., 20:1079
Weber, J.R., Nondestructive examination development and demonstration plan, 20:355 (R;US)
Webster, I.A., *See* Tsotsis, T.T., 20:57
Webster, N., *See* Phillips, C.A., 20:626
Weeks, B., *See* Weeks, J., 20:935
Weeks, J., Using Process Quality Management Improvement (PQMI) to develop business processes and procedures, 20:935 (R;US)
Wegge, S., Inhibition of sulfide growth on iron by means of alloying elements and by means of carbon deposition in the gaseous phase: Final report, 20:1117 (R;DE;In German)
Wei, Jie, Crystalline beams, 20:1527 (R;US)
Wei, T.Y.C., *See* Reifman, J., 20:820
Wei-Chyung, Wang, A report on workshops: General circulation model study of climate- chemistry interaction, 20:1709 (R;US)
Weigert, H., *See* Henning, P.A., 20:2207
Weigold, E., *See* Storer, P., 20:1259
See Vos, M., 20:1255
Weihong, Z., *See* Oitmaa, J., 20:2391
Weikert, R., *See* Pfanz, H., 20:1965
Weiner, D., Grid-connected solar power generation a utility's view, 20:680 (IA;IL)
Weiner, E.O., SASSI system software configuration, 20:1454 (R;US)
Weingardt, K.M., *See* Lamberd, D.L., 20:360
Weiser, P.S., Orientation and polarization effects in the Raman spectroscopy of (110) diamond faces in CVD deposited diamond films, 20:1257 (IA;AU)
Weiss, S.G., *See* Johnson, A.R., 20:469
Weilage, S., *See* Devendra, R., 20:586
Weller, R.E., *See* Mahlum, D.D., 20:512
Wellisch, J.P., Measurement of the structure function F_2 of the proton in deep inelastic e-p scattering with the H1 detector at the HERA storage ring, 20:2179 (R;DE;In German)
Wellsfry, H.E., Project L-070, "300 Area process sewer piping system upgrade" Project Management Plan, 20:1771 (R;US)
Welter, H., *See* Bett, A., 20:683
Wemhoff, G.M., Budget FY 1995 site support program plan WBS 6.10.1, 20:2519 (R;US)
Wender, I., *See* Tierney, J.W., 20:34
Wenhausen, P.A.P., High coercive $Sm_2Fe_{17}N_x$ powders prepared by HDDR, 20:1121 (IA;AU)
Werner, S.A., *See* Allman, B.E., 20:2004
West, J.S., *See* Myers, J., 20:91
Wheatcraft, S.W., *See* Ross, W.C., 20:1850
Wheelis, W.T., *See* Gundiler, I.H., 20:318
Whitaker, R., *See* Akau, R.L., 20:1696
White, C.J., Selenophene transition metal complexes, 20:1364 (R;US)
White, G.J., Nitrate analysis of snow and ice core samples collected in the vicinity of a waste detonation event, McMurdo Station, Antarctica, 20:1792 (R;US)
White, J.M., *See* Kellerman, B.K., 20:1286
White, M.A., Anti-foam System design description, 20:412 (R;US)
White, R.K., *See* Miller, P.D., 20:499
Whitehouse, C.R., *See* Usher, B.F., 20:2324
Whiteson, R., *See* Badalamente, R.V., 20:558
Whitlow, H.J., *See* Walker, S.R., 20:2330
Wiblin, W., The use of Au-198 in evaluation of current efficiency in commercial aluminium reduction cell, 20:583 (IA;TH;In Thai)
Widmann, P., Development of the optical components of an alignment system for the muon spectrometer of the ATLAS detector, 20:1654 (R;DE;In German)
Widmark, A., *See* Olerud, H.M., 20:1924
Widrig, J.E., *See* Stenehjem, E.J., 20:933
Wieclaw, B., Isotopic density gauge of ceramic bodies, 20:605 (IA;PL)
Wiegel, J.K.W., *See* Peck, H.D. Jr., 20:1846
Wielunski, L.S., New automatic RBS/channeling system for thin film material analysis, 20:2331 (IA;AU)
Wiencek, T.C., LEU ^{99}Mo target fabrication and testing: Overview, status, and plans, 20:839 (R;US)
Wierzchnicki, R., *See* Owczarczyk, A., 20:592
See Szpilowski, S., 20:593
Wiessner, A., *See* Worbs, M., 20:70
Wijayatunga, P.D.C., Electricity pricing, 20:892 (I;LK)
Wikoff, P.M., Evaluation of the Brinecell® electrochemical oxidation unit for destruction of noncyanide strippers and other colored compounds in wastewaters, 20:1042 (R;US)
Wild, J.F., *See* Schaedel, M., 20:2241
Wilde, E.W., Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)
Wildenthal, B.H., *See* Vernotte, J., 20:2245
Wilder, D.G., *See* Lin, W., 20:322
Wildes, A.R., Two dimensional antiferromagnetic ordering in MnPS3, 20:1265 (IA;AU)
Wilgocki, M., The ESR-spectroelectrochemical detection of organometallic W(+1) complex compounds, 20:1356 (IA;PL)
Wilkins, N.E., Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)
Wilkins, S., Applications of synchrotron radiation to materials science and the Australian National Beamline Facility at the Photon Factory, 20:2338 (IA;AU)
Will, W., *See* Alberts, W.G., 20:1942
Willen, E., *See* Wanderer, P., 20:1544
Williams, D.M., *See* Powell, G.L., 20:1338
Williams, F.A., *See* Margolis, S.B., 20:1425
Williams, G.P., *See* Biscardi, R., 20:1528
See Hirschmugl, C.J., 20:1663
Williams, G.V.M., Spin gap behaviour of YBa_2 $(Cu_{1-x}$ $Zn_x)_4$ O_8, 20:2377 (IA;AU)
Williams, J.S., *See* McCubbery, M.D., 20:1277
Williams, M.D., Development of methods for evaluating options for improving the air quality in Santiago, Chile and its environs, 20:1766 (R;US)
See Short, S.M., 20:511
Williams, N.C., *See* Valero, O.J., 20:327
Williams, P.M., Bases for the MHTGR source term and containment concepts, 20:772 (RA;XA)
Willis, M.P., *See* Radel, R.J., 20:1054
Willmes, H., *See* Maass, K., 20:1079
Wilmanns, E., *See* Foy, B.R., 20:290

Wilmarth, S.R., *See* Cromar, R.D., 20:417
Wilson, G.V., *See* Gwo, J.P., 20:295
Wilson, K.B., *See* Haas, J.C., 20:12, 20:13
Wilson, K.J., *See* Johnson, A.R., 20:469
Wilson, R.B., *See* Hirschon, A.S., 20:631, 20:632
Wilson, R.H., *See* Halperin, D., 20:1447
Wilson, S.M., *See* Sorge, J.N., 20:80
Wiltsee, G., Small-scale biomass fueled cogeneration systems - A guidebook for general audiences, 20:1055 (R;US)
Winchell, B.M., Partnering with Sandia National Laboratories through alliances or consortia, 20:936 (R;US)
Wineman, S.J., *See* Christon, M.A., 20:1452
Winkelman, W.D., *See* Rebagay, T.V., 20:420
Winker, S., A definition of the domains Archaea, Bacteria and Eucarya in terms of small subunit ribosomal RNA characteristics, 20:1863 (R;US)
Winnick, J., High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)
Wio, H.S., A phase-transition induced by the struggle for life in a competitive coexistence model in ecology, 20:2017 (R;XA)
Quantum mechanical analogy for solving a competitive coexistence model in ecology, 20:2016 (R;XA)
See Rodriguez, M.A., 20:2012
Wipke, K., Current Hybrid Electric Vehicle performance based on temporal data from the world's largest HEV fleet, 20:1083 (R;US)
Wise, D.L., *See* Levendis, Y.A., 20:739
Wishard, B.E., *See* Harlan, R.A., 20:559
Witcher, J.C., Alpine 1/Federal: Executive summary final report, 20:709 (R;US)
Alpine 1/Federal: Temperature gradients, geothermal potential, and geology: Final report, Part 2, 20:710 (R;US)
Witham, L.C., Channeling contrast microscopy of defects in type II-VI MSM photodetectors, 20:2328 (IA;AU)
Wittekind, W.D., Critically safety evaluation for K Basins sandfilters, 20:344 (R;US)
Witwer, M., *See* Borgstedt, H.U., 20:1113
Witzenburg, W. van, *See* Borgstedt, H.U., 20:1113
Woch, J., *See* Shapshak, M., 20:2425
Woese, C.R., *See* Winker, S., 20:1863
Wohlgemuth, *See* Berman, D., 20:647
Wojewodzka, M., Calcium antagonist, TMB-8, prevents the induction of adaptive response by hydrogen peroxide in human lymphocytes, 20:1919 (IA;PL)
Wojtowicz, A., *See* Stachowicz, W., 20:1402
Wolf, H., *See* Kist, R., 20:1664
Wolf, L., Passive heat removal experiments for an advanced HTR-module reactor pressure vessel and cavity design, 20:785 (RA;XA)
See Kugeler, K., 20:784
Wolfenbarger, F.M., A field test and evaluation of exterior fiber optic intrusion detection sensors, 20:1446 (R;US)
Wolke, M., A large-area scintillation detector with matrix readout for experiments at COSY, 20:1643 (R;DE;In German)
Woloshun, K., Summary of evaporative cooling system for the SSC silicon tracker, 20:1649 (R;US)
Wolsky, A.M., *See* Brockmeier, N.F., 20:734
Wolters, J., Implementation of a structural dependent model for the superalloy IN738LC in ABAQUS-code, 20:1147 (R;DE;In German)
Womble, P.C., Non destructive characterization using pulsed fast-thermal neutrons, 20:1293 (R;US)
Wong, M.S., *See* Barnett, S.A., 20:1247
Wood, D.E., Performance assessment task team progress report, 20:238 (R;US)
Wood, E.L., *See* Wiencek, T.C., 20:839
Wood, M.I., *See* Seitz, R.R., 20:239
Wood, R.T., The Plant-Window system: A flexible, expandable computing environment for the integration of power plant activities, 20:806 (R;US)
Wood, W.M., Preformed transient gas channels for laser wakefield particle acceleration, 20:1522 (R;US)
Wootan, D.W., Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)
Worbs, M., Microbial transformation of inorganic and organic sulphur compounds, 20:70 (I;DE;In German)
Worl, L.A., *See* Schake, A.R., 20:503
Wright, J., Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method, 20:509 (R;US)
Wright, S.J., Stable parallel elimination for boundary valve ODEs, 20:2526 (R;US)
Wrobel, D.P., *See* Nance, W.R., 20:1504
Wrobel, J., *See* Martino, L., 20:1773
Wronska, T., *See* Ambroz, H.B., 20:1401
Wronski, W., Comparison of the resistance of integrated circuits to various types of nuclear radiation, 20:1662 (IA;PL)
Wu Guanglu, Behavior of off-centered beams in an RFQ due to image charge force, 20:1536 (RA;JP)
Wu, C.T., *See* Wiencek, T.C., 20:839
Wu, E., *See* Chambell, S.J., 20:1178
See Kennedy, S.J., 20:1127
Wu, H.J., *See* Hirschon, A.S., 20:632
Wu, K., Energy profiles of selected Latin American and Caribbean countries: Report series No. 2, 20:974 (R;US)
Regional overview of Latin American and Caribbean energy production, consumption, and future growth: Report series No. 1, 20:973 (R;US)
Wu, Q., *See* Ishii, M., 20:881
Wu, S., Heterojunctions of Cd Se and amorphous silicon, 20:1272 (IA;AU)
Wurm, J., *See* Hemzal, K., 20:1037
Wurth, R., *See* Albrecht, H., 20:2144, 20:2146
Wurzinger, R., *See* Frascaria, R., 20:2252
Wyrwoll, K.H., Alligator Rivers Analogue project. Geomorphology and paleoclimatic history: Final Report - Volume 3, 20:1801 (I;AU)

X

Xia, J.A., The defects of high J_c melt textured $YBa_2 Cu_3 O_{7-x}$ superconductors, 20:1194 (IA;AU)
See Zhao, Y., 20:1196
Xiong, Z., Electrically detected magnetic resonance from a silicon p-n junction diode, 20:2326 (IA;AU)
See Miller, D.J., 20:2368
Xu, Jianmin, Phase formation at the Fe-rich end of Dy-Fe-Ti system, 20:1124 (IA;AU)
See Li, Hongshuo, 20:1131, 20:1133
Xu, W., Enhanced spin g-factor and split Landau-level for AlGaAs/GaAs heterostructures in strong magnetic fields, 20:2322 (IA;AU)
Xue, Y., Novel absorption detection techniques for capillary electrophoresis, 20:1327 (R;US)

Y

Ya-Anant, N., Treatment of low-level radioactive cesium-137 and technetium-99 liquid wastes by inorganic ion-exchangers, 20:276 (I;TH;In Thai)
Yabuki, H., *See* Artru, X., 20:2198
Yaconi, G.A., *See* Lanagan, M.T., 20:1478
Yagi, M., Hybrid model in general geometry, 20:2405 (R;US)
Yahr, G.T., *See* Swinson, W.F., 20:607
Yakle, J., *See* Staple, B.D., 20:880
Yamada, Masafumi, Public acceptance (PA) activities of nuclear power in Japan, 20:948 (I;XA)
Yamagishi, Shigeru, Development of a rapid gelation apparatus with microwave heating, 20:818 (R;JP;In Japanese)
Yamaguchi, N., *See* Odagiri, J., 20:1570
Yamaguchi, Seiya, Design of an RF window for L-band CW klystron based on thermal-stress analysis, 20:1577 (RA;JP;In Japanese)
Development of recirculating RF pulse compression system, 20:1576 (RA;JP;In Japanese)

See Hanaki, Hirofumi, 20:1575
See Suzuki, Kunio, 20:1574
Yamakawa, H., Thermal test and analysis for transporting vitrified high-level radioactive wastes, 20:1437 (IA;JP)
Thermal test and analysis of a spent fuel storage cask, 20:207 (IA;JP)
See Saegusa, T., 20:199
Yamazaki, Y., *See* Kageyama, T., 20:1564
Yamazaki, Yoshishige, *See* Ueno, Akira, 20:1558
See Yoshino, Kazuo, 20:1561
Yamkate, P., Radionuclide migration from shallow land disposal site, 20:1800 (IA;TH;In Thai)
Yanagihara, S., Measurement of diesel exhaust particulate by using CO2 conversion.: Separating measure for volatile components and total soot by heating collection filter, 20:1071 (IA;JP;In Japanese)
Yanagisawa, Hiroshi, Initial tank calibration at NUCEF critical facility. 2: Data analysis, 20:1439 (R;JP;In Japanese)
Yanase, N., *See* Isobe, H., 20:1803
Yanase, Nobuyuki, *See* Edis, R., 20:1802
Yang, Fuming, *See* Li, Hongshuo, 20:1131
Yang, Q., *See* Osgood, R.M. Jr., 20:1375
Yang, S., High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994, 20:1177 (R;US)
Yang, W.C., *See* Newby, R.A., 20:9, 20:10
Yaremko, A.M., *See* Kruchinin, S.P., 20:1234
Yarovoj, V.G., *See* Matsakova, A.A., 20:1224
See Tret'yakov, V.M., 20:1226
Yarrington, P., *See* Kmetyk, L.N., 20:2026
Yashima, Mutsuo, *See* Chen, Wei-Yin, 20:69
Yau, J., Strain tolerant multifilamentary Bi Pb-2223 tapes for power applications, 20:2381 (IA;AU)
See Dou, S.X., 20:1120
Yavas, O., *See* Bett, A., 20:683
Yavuz, M., Production of superconducting thick films through cation chelated organic precursors, 20:1186 (IA;AU)
Yazidjoglou, N., *See* Hutchinson, W.D., 20:2319
Yen, S.C.M., Characterization of coal particles using rule base on-line image analysis: [Quarterly] technical report, December 1, 1993–February 28, 1994, 20:56 (R;US)
Yin Zuhua, *See* Heber, U., 20:1963
Yin, Y., Electron energy-loss spectroscopy study of thermal annealing of amorphous hydrogenated carbon, 20:1261 (IA;AU)
Yogev, A., Large scale maximum concentration central receiver systems, 20:681 (IA;IL)
Yonezawa, H., *See* Odagiri, J., 20:1570
Yonezawa, Hiroshi, *See* Sakamoto, Mitsunori, 20:1566
Yoo, M.H., Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Yoon, P., Electrical simulation and analysis of large complex electrical systems, 20:884 (R;US)
Yoon, R.H., Development of enhanced sulfur rejection processes: Final technical progress report: Seventh quarter, April 1, 1994–June 30, 1994, 20:5 (R;US)
York, D.A., *See* Francis, C.W., 20:223
Yortsos, Y.C., Modification of chemical and physical factors in steamflood to increase heavy oil recovery: Annual report, October 1, 1992–September 30, 1993, 20:115 (R;US)
Yoshida, Kazuko, The effect of calorie restriction of radiation-induced myeloid leukemogenesis, 20:1940 (RA;JP;In Japanese)
Yoshino, K., *See* Kageyama, T., 20:1564
Yoshino, Kazuo, Design of MEBT short Q-magnets with large bores using MAFIA for the JHP proton linac, 20:1561 (RA;JP;In Japanese)
Yoshizawa, Kunio, *See* Ikeda, Kazumi, 20:1538
Yossef, S.K., Electronic stability and reproducible accuracy of HARSHAW 2000(A,B) TLD-analyzer, 20:1480 (R;EG)
You Deliang, Development of nuclear energy and nuclear policy in China, 20:955 (I;XA)
Young, H.W., *See* Cecil, L.D., 20:1784
Young, J.P., *See* Nance, W.R., 20:1504
Young, J.Y., *See* Mahlum, D.D., 20:512
Youssef, A., *See* Saad, S.M., 20:2287
Youssef, S.K., Parameters affecting the calibration uniformity and traceability of gamma measuring devices, 20:1907 (R;EG)
See Henaish, B.A., 20:1615
Yow, J.L. Jr., *See* Milanovich, F.P., 20:1839
Yu Lu, *See* Wang Wen-zheng, 20:2297
Yu, C., Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0, 20:218 (R;US)
See Faillace, E.R., 20:1906
Yu, K.M., *See* Moll, A.J., 20:1284
Yu, Liya, Nitration of polynuclear aromatic hydrocarbons in coal combustors and exhaust streams: Quarterly report, April 1, 1994–June 30, 1994, 20:55 (R;US)
Yu, N., In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory, 20:1237 (R;US)
Yu, P.Y., *See* Su, Z.P., 20:2306
Yu, S.S., *See* Kwan, J.W., 20:1890
Yuan, V.W., Simulation and steering in the intertank matching section of the ground test accelerator, 20:1588 (R;US)
Yuhara, T., *See* Tsuda, K., 20:1249
Yur'ev, M.Z., *See* Barashenkov, V.S., 20:2056

Z

Zachar, M., *See* Nimal, J.C., 20:188
Zagorodnij, A.G., Dynamics of structure formation in nonequilibrium systems (Wave Media), 20:2413 (R;UA;In Russian)
Zagorski, Z.P., Indirect chiral effect alanines and tryptophans, 20:1408 (IA;PL)
Pulse radiolysis studies of short-lived species in solid amino acids as precursors of radicals detected by ESR, 20:1386 (IA;PL)
Spurs in solids, 20:1407 (IA;PL)
Zahoor, A., *See* Gamble, R.M., 20:811
Zahring, C., *See* Walker, S.R., 20:2330
Zaibel, E., *See* Kribus, A., 20:664
Zaider, M., *See* Hall, E.J., 20:1912
Zaidi, M.A., *See* Krynicki, J., 20:1219
Zaikov, R.P., *See* Stoilov, M.N., 20:2050
Zakrzewska, D., Isotope gauge and computer program for quality control of thickness coating process, 20:602 (IA;PL)
Zakrzewska-Trznadel, G., *See* Chmielewski, A.G., 20:1320
Zaloudek, F.R., The low pressure critical flow behavior of steam-water mixtures in constant area flow passages, 20:857 (R;US)
Zaltash, A., *See* Grossman, G., 20:1015
Zamfir, N.V., E1 and E3 transition rates in the sdf-IBA, 20:2206 (R;US)
See Casten, R.F., 20:2203, 20:2204
Zanetti, L., *See* Shapshak, M., 20:2425
Zarnstorff, M.C., Heating and transport in TFTR D-T plasmas, 20:2417 (R;US)
Zavadil, K.R., *See* Howard, A.J., 20:1507
Zawicki, L.R., Survivability of soldered leadless chip carriers after temperature cycling, 20:1500 (R;US)
Zazoui, M., *See* Krynicki, J., 20:1219
Zeltoun, A., Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3070), 20:149 (R;US)
Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3-70): Volume 2, Public comments and NRC response, 20:150 (R;US)
Zeltz, M., *See* Obertopp, T., 20:703
Zeldov, E., *See* Khaykovich, B., 20:2384
Zerbib, J.C., Operational management of very low level radioactive wastes: difficulties to elaborate a regulation device, 20:1909 (R;FR;In French)
Zerouaoui, J., *See* Saidi, E.H., 20:2038, 20:2039
Zerouaoui, S.J., *See* Kadiri, A., 20:2052
Zerwas, P.M., e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings, 20:2100 (R;DE)
See Barger, V., 20:2101
Zhang Min, *See* Gao Zuying, 20:775
Zhang You-jin, On Segal-Wilson's construction for the τ-functions of the constrained KP hierarchies, 20:1980 (R;XA)
Zhang, C., *See* Fisher, D., 20:2394

See Lerch, M.L.F., 20:2344
Zhang, F.M., A study of the Cu_3 Au(110) surface using low energy ion scattering, 20:1126 (IA;AU)
Zhang, G., *See* Ishii, M., 20:881
Zhang, H., On the sputtering of metals and insulators: A nonlinear evolution problem with nonlinear boundary condition, 20:2346 (R;US)
Zhang, W., *See* Adzic, G.D., 20:895
Zhao Hong, Welcome remarks, 20:950 (I;XA)
Zhao, X.K., Electrical and photoelectrochemical characterization of CdS particulate films by scanning electrochemical microscopy, scanning tunneling microscopy, and scanning tunneling spectroscopy, 20:2311 (R;US)
Zhao, X.L., *See* Cadogan, J.M., 20:1135
Zhao, Y., Structure and superconductivity in $YBaSrCu_{3-x}$ Sn_x O_y compound, 20:1196 (IA;AU)
The decoupling between the superconducting layers in $Bi_2Sr_2CaCu_2O_8/Bi_2Sr_2Ca_2Cu_3O_10$ intergrowth single crystals, 20:1260 (IA;AU)
Vortex-glass superconductivity in low magnetic field in YBa_2 Cu_3 O_{7-y}/V_2 O_5 composite, 20:1195 (IA;AU)
See Gu, G.D., 20:1218
See Xia, J.A., 20:1194
Zhe Chang, Coherent state path-integral representation of supersymmetric lattice models, 20:2365 (R;XA)
Zheltukhin, A.A., *See* Tugai, V.V., 20:2047
Zheng, Y., *See* George, M.A., 20:1621
Zheng, Z., *See* Klavetter, E.A., 20:317
Zhidkov, E.P., *See* Amirkhanov, I.V., 20:2545
Zhidkov, P.E., Quantization of a Hamiltonian system with an infinite number of degrees of freedom, 20:2058 (R;XJ)
Zhitariuk, N.I., *See* Buczkowski, M., 20:598
Zhou Bang-rong, Masses of heavy fermions and Higgs boson in four-generation fermion condensate scheme, 20:2089 (R;XA)
Zhou, X.L., Design of neutron beams at the Argonne Continuous Wave Linac (ACWL) for boron neutron capture therapy and neutron radiography, 20:1871 (R;US)
Zhu Jiang, Food irradiation in China: With emphasis on market testing and public acceptance, 20:1897 (IA;JP)
Zhusupov, M.A., *See* Peresypkin, V.V., 20:2230
Ziada, H.H., Stress analysis of core sampler truck number 2 platform: 2,000 LBF crane lift capacity, 20:1459 (R;US)
Ziakova, M., *See* Duchac, A., 20:2508
Zieborak, J., *See* Rzewuski, H., 20:2356
Zielen, A.J., *See* Yu, C., 20:218
Zimba, C., *See* Biscardi, R., 20:1528
Zimek, Z., The laboratory unit of SO_2 and NO_x removal from flue gases by simultaneous use electron beam and streams of microwave energy, 20:601 (IA;PL)
See Chmielewski, A.G., 20:599
See Palyska, W., 20:600
Zlock, H.J., *See* Woloshun, K., 20:1649
Ziolkowski, J.J., *See* Wilgocki, M., 20:1356
Zipfel, J., *See* Ruessel, K., 20:1435
Zitomer, M., Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
Zitvogel, E.P., A safety system for personnel and equipment protection at the AGS and RHIC, 20:1545 (R;US)
Zmijewska, W., Determination of antimony in natural waters by neutron activation analysis after separation on a chelating sorbent, 20:1322 (IA;PL)
See Chwastowska, J., 20:1325
Zocco, T.G., *See* Jervis, T.R., 20:1158
Zoeller, C., *See* Lisowski, P.W., 20:1587
Zolper, J.C., *See* Baca, A.G., 20:1505, 20:2307
See Howard, A.J., 20:1507
See Shul, R.J., 20:1287
Zolti, E., *See* Borgstedt, H.U., 20:1113
Zorin, V.P., *See* Abazov, V.M., 20:1888
Zubanov, D., The $^{13}C(e,p_{0,1})^{12}B$ differential cross section, 20:2275 (R;AU)
Zucca, J.J., CTBT technical issues handbook, 20:1099 (R;US)
Microearthquake monitoring and seismic imaging at The Geysers, 20:713 (R;US)
Zucchetti, M., *See* Borgstedt, H.U., 20:1113
Zuehlke, A.C., DACS upgrade acceptance test procedure, 20:373 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)
Zukowska-Cwik, G., The effects of new fuel additives on carbon deposition and wear of combustion engines, 20:596 (IA;PL)
Zvara, I., *See* Stuglik, Z., 20:1403
Zweben, S.J., *See* Darrow, D.S., 20:2419
Zygarlicke, C.J., *See* Benson, S.A., 20:63
Zyren, J., *See* Zitomer, M., 20:103

Subject Index

This index is arranged by subject descriptors selected from those assigned to each citation in this publication. Subject descriptors are selected from a controlled thesaurus of terms, ETDE/PUB–2(Rev.1), *International Energy: Subject Thesaurus*. In order to enhance indexing, subject descriptor entries generally consist of a pair of descriptors: a main term and a qualifier term. Each entry includes the full title (which may be followed by supplementary descriptive information in parentheses) and the citation number. Additional information given in parentheses indicates the document type (an abbreviation such as B for book), the country of publication (such as DE for Federal Republic of Germany), and the language if non-English.

See references guide users from synonymous terms to the descriptors selected for the concept. *See also* references indicate subject concepts that are more specific than a particular descriptor. To gain complete subject coverage, all such terms should be reviewed.

A

A CODES
AES6.0F: Automated Estimating System, 20:2537 (CM;US)

A-BOMB SURVIVORS
Cancer incidence in the atomic bomb survivors, 20:1938 (RA;JP;In Japanese)
G-banding analysis of radiation-induced chromosome damage in lymphocytes of Hiroshima atomic-bomb survivors, 20:1943 (R;JP)
Gene rearrangement and radiation carcinogenesis: BCR/ABL and RET oncogene, 20:1931 (RA;JP;In Japanese)

ABANDONED SITES
Baseline risk assessment of ground water contamination at the inactive uraniferous lignite ashing site near Belfield, North Dakota, 20:488 (R;US)
Electromagnetic scattering from buried objects, 20:1685 (R;US)
Road Transportable Analytical Laboratory (RTAL) System: Quarterly technical report, March 1993–May 1993, 20:1788 (R;US)

ABSORBED DOSES
See RADIATION DOSES

ABSORPTION REFRIGERATION CYCLE
Simulation and performance analysis of a quadruple-effect lithium bromide-water absorption, 20:1015 (R;US)

ABSORPTION SPECTROSCOPY
A new method to extract gas concentrations in the ultraviolet and visible wavelength ranges, based on differential optical absorption technique and Fourier transform, 20:1652 (R;SE)

ACCELERATOR FACILITIES
Activation concentrations outside the SSC accelerator enclosures, 20:1598 (R;US)
Low-level RF LabVIEW® control software user's manual: Version 1.0, 20:1586 (R;US)
The Radiological Research Accelerator Facility: Progress report, December 1, 1993–November 30, 1994, 20:1913 (R;US)

ACCELERATORS
See also ELECTROSTATIC ACCELERATORS
HEAVY ION ACCELERATORS
LINEAR ACCELERATORS
MESON FACTORIES
PARTICLE BEAM FUSION ACCELERATOR
Approach to compact terawatt CO_2 laser system for particle acceleration, 20:1516 (R;US)
In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory, 20:1237 (R;US)
Moment approach to high-order accelerator beam optics, 20:1539 (R;US)
Proceedings of the Workshop on Simulating Accelerator Radiation Environments, 20:1521 (R;US)
Safety in design and operation of low energy particle accelerators, 20:1513 (R;EG)
The principle of phase stability and the accelerator program at Berkeley, 1945–1954, 20:1523 (R;US)
The solid-state rf power amplifier for accelerator, 20:1582 (RA;JP;In Japanese)
Update on the ATF inverse Cerenkov laser acceleration experiment, 20:1514 (R;US)
Waveguiding by axicon-focused laser beams, 20:1515 (R;US)
Wavelet analysis and accelerator signals, 20:1546 (R;US)
Xwake 1.0 user's manual, 20:1535 (R;US)

ACCIDENTAL IRRADIATION
See RADIATION ACCIDENTS

ACCOUNTABILITY (NUCLEAR MATERIALS)
See NUCLEAR MATERIALS MANAGEMENT

ACES
See QUARKS

ACETATES
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)

ACID RAIN
Effect of acid deposition on soil animals and microorganisms: influence on structures and processes, 20:1959 (IA;DE)

ACID SILICATES
See SILICATES

ACIDIFICATION
Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)
Reaction and interaction of mycorrhizae and rhizosphere, 20:1958 (IA;DE)

ACIDS (INORGANIC)
See INORGANIC ACIDS

ACIDS (ORGANIC)
See ORGANIC ACIDS

ACOUSTIC MICROSCOPY
Three-dimensional image processing for acoustic microscopy, 20:1497 (R;US)

ACQUISITION (DATA)
See DATA ACQUISITION

ACRIDONES
See KETONES

ACTINIDES
See also AMERICIUM
PLUTONIUM
URANIUM
Magnetic separation for environmental remediation, 20:503 (R;US)
Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:1787 (R;US)

ACTINIUM ADDITIONS
See ALLOYS

ACTIVATION (RADIO)
See RADIOACTIVATION

ACTIVITY COEFFICIENT
See REACTION KINETICS

ACTIVITY LEVELS
Operational management of very low level radioactive wastes: difficulties to elaborate a regulation device, 20:1909 (R;FR;In French)
ADL PROCESS
See COAL LIQUEFACTION
ADMINISTRATIVE PROCEDURES
See also LICENSING PROCEDURES
Automated Transportation Management System (ATMS) user's manual: Revision 1, 20:209 (R;US)
ADRENAL GLANDS
Labelling of meta-iodobenzylguanidine with iodine-131 (I-131-MIBG) for adrenal gland diagnosis, 20:1414 (I;TH;In Thai)
ADSORBENTS
See also BIOADSORBENTS
A study of analytical properties of chelating sorbents obtained by immobilization of chelating agents on solid supports. Analytical properties of thionalide loaded acrylic resin, 20:1325 (IA;PL)
Advanced sulfur control concepts in hot-gas desulfurization technology: Quarterly report, April–June 1994, 20:16 (R;US)
Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)
Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:66 (R;US)
New, high-capacity, calcium-based sorbents: Calcium silicate sorbents: Final report, 20:51 (R;US)
Solid waste sampling and distribution project: Sampling report #4, 20:62 (R;US)
ADSORPTION
Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)
ADVANCED LIGHT SOURCE
A multiple objective magnet sorting algorithm for the ALS insertion devices, 20:1604 (R;US)
ALS Multiple Trim Magnets, or "Magic Fingers," for insertion device field integral correction, 20:1591 (R;US)
Advanced Light Source elliptical wiggler, 20:1605 (R;US)
Advanced Light Source: Users' Handbook, 20:1607 (R;US)
Chemical sciences, annual report 1993, 20:1365 (R;US)
Undulators at the ALS, 20:1590 (R;US)
AEROBACTER
Microbial growth in district heating pipes - preliminary investigation, 20:1061 (R;DK;In Danish)
AEROSOLS
See also RADIOACTIVE AEROSOLS
A report on workshops: General circulation model study of climate- chemistry interaction, 20:1709 (R;US)
Effects of tropospheric aerosols on radiative flux calculations at UV and visible wavelengths, 20:1770 (R;US)
Improvement of a wet process for the separation of aerosols, 20:1762 (R;DE;In German)
Theoretical and experimental studies for the measurement of stratospheric aerosols and the influence of multiple backscattering on the cloud measurement with a polarization Raman lidar, 20:1746 (R;DE;In German)
AFR STORAGE
See AWAY-FROM-REACTOR STORAGE
AFTER-HEAT
Analytical and experimental investigations of the passive heat transport in HTRs under severe accident conditions, 20:779 (RA;XA)
Distribution of the decay heat in various modul HTRs and influence on peak fuel temperatures, 20:774 (RA;XA)
Principles of decay heat removal in reactor technology - Present status and future prospects, 20:744 (RA;XA)
Safety criteria and provisions for the evacuation of residual heat from graphite gas cooled reactors, 20:771 (RA;XA)
The ultimate safety of the HTR-Module during hypothetical accidents, 20:773 (RA;XA)
AFTER-HEAT REMOVAL
Analysis of afterheat removal from modular HTGRs during accidents, and a concept for use of spherical fuel elements in LWRs, 20:782 (RA;XA)
Development of an inactive heat removal system for high temperature reactors, 20:784 (RA;XA)
Flow schemes and design features of HTGR residual heat removal systems, 20:776 (RA;XA)
Modeling and analysis of heat transfer from the MHTGR core through a steel reactor vessel to the reactor cavity cooling system, 20:781 (RA;XA)
Passive heat removal experiments for an advanced HTR-module reactor pressure vessel and cavity design, 20:785 (RA;XA)
Presentation of decay heat removal computer codes used for gas cooled reactors, 20:780 (RA;XA)
Reflux condenser mode with non-condensible gas: assessment of Cathare against Bethsy test 7.2C, 20:759 (R;FR)
SANA experiments related to self-operating removal of decay heat, 20:787 (RA;XA)
AGING
The effect of proteins on the aging properties of radiation vulcanized natural rubber latex, 20:1381 (I;PH)
AGRICULTURAL COOPERATIVES
See AGRICULTURE
AGRICULTURAL RESIDUES
See AGRICULTURAL WASTES
AGRICULTURAL WASTES
See also MANURES
A process for separating acid-sugar mixtures using ion exclusion chromatography, 20:627 (R;US)
Compost preparation of agricultural and non-agricultural organic recyclings: Proceedings, 20:1057 (I;DE;In German)
Conceptual study of model introduced to utilize wastes as energy in Hokkaido, 20:1048 (R;JP;In Japanese)
Wastes and by-products - alternatives for agricultural use, 20:1035 (R;US)
AGRICULTURE
Bundesforschungsanstalt fuer Landwirtschaft Braunschweig-Voelkenrode (FAL). Annual report 1993, 20:616 (I;DE;In German)
Nuclear techniques in agriculture and industry in China, 20:954 (I;XA)
Nuclear techniques in food and agriculture with special reference to environmental protection, 20:1905 (IA;PL)
Summary data 1992, 20:1051 (R;US)
Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
AGRINI EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
AHARONOV-BOHM EFFECT
On δ perturbative interactions in the Aharonov-Bohm and Anyon models, 20:1996 (R;FR)
Al AQUEOUS CARBONATE PROCESS
See DESULFURIZATION
AIR CLEANING SYSTEMS
B Plant retired HEPA filters engineering study (Project W-059), 20:358 (R;US)
AIR CONDITIONERS
Prototype testing of Branched GAX air conditioning cycle: Third quarterly report, 1994, 20:1016 (R;US)
AIR FILTERS
Advanced coal-fueled industrial cogeneration gas turbine system particle removal system development, 20:82 (R;US)
B Plant retired HEPA filters engineering study (Project W-059), 20:358 (R;US)
IF&P Fibrosic™ filters, 20:61 (R;US)
AIR FLOW
Stability effects on the profiles of vertical velocity and its variance in katabatic flow, 20:717 (R;US)
AIR POLLUTION
See also INDOOR AIR POLLUTION
Absorption Spectroscopy
A new method to extract gas concentrations in the ultraviolet and visible wavelength ranges, based on differential optical absorption technique and Fourier transform, 20:1652 (R;SE)

Biological Effects
Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)
Early biochemical effects of air pollutants: detection and possible significance for forest trees, 20:1964 (IA;DE)
Forest decline in ecosystem perspective, 20:1953 (IA;DE)
International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings, 20:1952 (I;DE;In German, English)
International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings, 20:1950 (I;DE;In German, English)
Microscopical aspects of foliar alterations in declining trees, 20:1960 (IA;DE)
Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge, 20:1965 (IA;DE)
Reactions of tree species to air pollutants under controlled conditions, 20:1961 (IA;DE;In German)
The response of leaves to potentially acidic gases, 20:1963 (IA;DE)
Trends in, and current state of, forest damage surveying, 20:1954 (IA;DE;In German)

Carboxylation
Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge, 20:1965 (IA;DE)

Classification
Trends in, and current state of, forest damage surveying, 20:1954 (IA;DE;In German)

Dose-Response Relationships
Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)
State of the discussion on standard values for atmospheric pollutant concentrations, 20:1819 (IA;DE;In German)

Federal Republic Of Germany
Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)

Forests
Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)
Early biochemical effects of air pollutants: detection and possible significance for forest trees, 20:1964 (IA;DE)
Forest decline in ecosystem perspective, 20:1953 (IA;DE)
International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings, 20:1952 (I;DE;In German, English)
International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings, 20:1950 (I;DE;In German, English)
Trends in, and current state of, forest damage surveying, 20:1954 (IA;DE;In German)

Genetic Variability
Importance of the genetic structure in tree species for forest ecosystems under the influence of air pollutants, 20:1962 (IA;DE)

Global Aspects
The Ikarus project, 20:918 (IA;IL)

Leaves
The response of leaves to potentially acidic gases, 20:1963 (IA;DE)

Ozone
Early biochemical effects of air pollutants: detection and possible significance for forest trees, 20:1964 (IA;DE)

Photosynthesis
Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge, 20:1965 (IA;DE)

Plant Growth
Forest damage and incremental growth, 20:1955 (IA;DE;In German)

Spruces
Photosynthesis of damaged and undamaged forest trees: a study with spruce in the Fichtelgebirge, 20:1965 (IA;DE)

Terrestrial Ecosystems
Forest decline in ecosystem perspective, 20:1953 (IA;DE)

Toxicity
Forest decline in ecosystem perspective, 20:1953 (IA;DE)
International congress on forest decline research: State of knowledge and perspectives. Vol. 1: Proceedings, 20:1952 (I;DE;In German, English)
International congress on forest decline research: State of knowledge and perspectives. Vol. 2: Proceedings, 20:1950 (I;DE;In German, English)

Transpiration
Microscopical aspects of foliar alterations in declining trees, 20:1960 (IA;DE)

Trees
Microscopical aspects of foliar alterations in declining trees, 20:1960 (IA;DE)
Reactions of tree species to air pollutants under controlled conditions, 20:1961 (IA;DE;In German)

USA
Temporal development of the pollution load of reactive trace gases in forested areas in the United States, 20:1757 (IA;DE)

Weather
Temporal development of the pollution load of reactive trace gases in forested areas in the United States, 20:1757 (IA;DE)

X-Ray Fluorescence Analysis
Analysis of gaseous SO_2 and particulate Fe, Pb, S in air pollutants by XRF method, 20:1315 (IA;PL)

AIR POLLUTION ABATEMENT
CO_2 burden and climatic risk: Strategies of action of the German electricity supply companies, 20:920 (I;DE;In German)
Energy concept Mainz: Analysis and assessment of scenarios and measures for CO_2 abatement, 20:1058 (I;DE;In German)
Present status of petroleum substitution energy (UK), 20:1091 (R;JP;In Japanese)

AIR POLLUTION MONITORING
Air quality in the metropolitan area 1992-93, 20:1768 (R;DK;In Danish)

AIR SAMPLERS
In situ sampling device development engineering task plan, 20:398 (R;US)

AIR-WATER INTERACTIONS
Climatological features of blocking anticyclones, 20:1726 (RA;US)

AIRBORNE PARTICLES
See PARTICULATES

AIRBORNE PARTICULATES
See PARTICULATES

AIRCRAFT
A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores, 20:2556 (R;US)
Damage detection and health monitoring of operational structures, 20:1445 (R;US)
Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas, 20:120 (R;US)
Light shaping diffusers™ improve aircraft inspection, 20:1033 (R;US)

AIRCRAFT COMPONENTS
Light shaping diffusers™ improve aircraft inspection, 20:1033 (R;US)

ALANINES
Indirect chiral effect alanines and tryptophans, 20:1408 (IA;PL)

ALARM SYSTEMS
See also INTRUSION DETECTION SYSTEMS
Analysis of criticality alarm system response to an accidental criticality outside the cascade process buildings at the Portsmouth Gaseous Diffusion Plant, 20:151 (R;US)
Human factors engineering guidance for the review of advanced alarm systems, 20:830 (R;US)

ALASKA
Source evaluation report phase 2 investigation: Limited field investigation: Final report: United States Air Force Environmental Restoration Program, Eielson Air Force Base, Alaska, 20:1828 (R;US)

ALASKA RIVER
See ALASKA RIVERS
ALBEDO
Meso-scale cooling effects of high albedo surfaces: Analysis of meteorological data from White Sands National Monument and White Sands Missile Range, 20:1822 (R;US)
ALCOHOL FUELS
See also ETHANOL FUELS
METHANOL FUELS
The economical production of alcohol fuels from coal-derived synthesis gas: Eleventh quarterly technical progress report, April 1, 1994–June 30, 1994, 20:33 (R;US)
ALCOHOLS
See also ETHANOL
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 33: Quarterly technical status report for third quarter fiscal year 1993 (April 1–June 30, 1993), 20:30 (R;US)
ALGEBRA
On the Cohen-Macaulayness and Gorensteinness of integral closure filtrations Rees algebras of height-two equimultiple ideals, 20:1981 (R;XA)
The criteria for the Cohen-Macaulayness and Gorensteiness of Rees algebras of ideals having positive analytic deviation, 20:1984 (R;XA)
ALGEBRAIC CURRENTS
Conserved currents for ed-e' N N, ed-e'd' and γd - N N reactions in the framework of three-dimensional field theoretical formulation, 20:2261 (R;XJ)
Currents on Grassmann algebras, 20:2060 (R;FR)
ALGEBRAIC FIELD THEORY
Localized endomorphisms of the chiral Ising model, 20:2032 (R;DE)
On exotic supersymmetries of the $\phi_{1,3}$ deformation of minimal models, 20:2052 (R;XA)
ALGORITHMS
Validation of Nuclear Criticality Safety Software and 27 energy group ENDF/B-IV cross sections, 20:1443 (R;US)
ALKALIS
See HYDROXIDES
ALKAZID PROCESS
See DESULFURIZATION
ALKENES
See also 2-METHYLPROPENE
BUTENES
ETHYLENE
PROPYLENE
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992), 20:28 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992), 20:26 (R;US)
ALKYLATES
See ALCOHOLS
ALLOY 800H
See INCOLOY 800H
ALLOY-1915
See ALUMINIUM BASE ALLOYS
ALLOY-214X
See ALUMINIUM BASE ALLOYS
ALLOY-50KH4N6G12F2V
See CHROMIUM ALLOYS
ALLOY-60T
See TITANIUM BASE ALLOYS
ALLOY-79NM
See NICKEL BASE ALLOYS
ALLOY-GE
See COPPER ALLOYS
ALLOY-GMR-235
See NICKEL BASE ALLOYS
ALLOY-HD-8077
See NICKEL BASE ALLOYS
ALLOY-KH20N80T
See NICKEL BASE ALLOYS
ALLOY-KHN77TYU
See NICKEL BASE ALLOYS
ALLOY-M-252
See NICKEL BASE ALLOYS
ALLOY-MA-754
See NICKEL BASE ALLOYS
ALLOY-MA-956
See IRON BASE ALLOYS
ALLOY-MM-0011
See NICKEL BASE ALLOYS
ALLOY-VTZ-1
See TITANIUM BASE ALLOYS
ALLOY-WAZ-16
See NICKEL BASE ALLOYS
ALLOYS
See also ALUMINIUM ALLOYS
BORON ALLOYS
CHROMIUM ALLOYS
COPPER ALLOYS
HEAT RESISTING ALLOYS
INCOLOY ALLOYS
IRON ALLOYS
LITHIUM ALLOYS
MAGNESIUM ALLOYS
NICKEL ALLOYS
NIOBIUM ALLOYS
SILICON ALLOYS
TANTALUM ALLOYS
TITANIUM ALLOYS
TUNGSTEN ALLOYS
VANADIUM ALLOYS
Analysis of alloys by energy dispersive X-ray fluorescence method, 20:1326 (IA;PL)
Development of a relational database for rated values of metallic materials: Final report, 20:2570 (I;DE;In German)
Feasibility study of power generation system with shape memory alloys, 20:1159 (R;JP;In Japanese)
The effect of elastic stress on Ostwald Ripening Phenomena: Final report, August 1, 1990–July 31, 1993, 20:1108 (R;US)
The metallurgy of superalloys part 1., 20:1101 (R;EG)
The metallurgy of superalloys part 2, 20:1102 (R;EG)
ALLUVIAL DEPOSITS
Preliminary surficial geologic map of the Rocky Flats Plant and vicinity, Jefferson and Boulder Counties, Colorado, 20:1840 (R;US)
ALMENDRO EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
ALPHA PARTICLE MODEL
See CLUSTER MODEL
ALPHA PARTICLES
The bond structure of closed shells in condensed nuclear matter, 20:2208 (IA;AU)
ALPHA SPECTROMETERS
Radon discrimination for work place air samples, 20:471 (R;US)
ALPHA-BEARING WASTES
Certification
Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)
Classification
Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Criticality
Criticality safety evaluation for TRU waste in storage at the RWMC, 20:496 (R;US)
Fissile Materials
Measurement technique of radwaste content: For TRU, 20:555 (IA;JP;In Japanese)

Ground Disposal
INEL Operable Unit 7-13 containment and stabilization configuration option, 20:263 (R;US)
Monitoring
Methods for estimating the content of transuranium and other difficult to measure nuclides in produced rad waste from BWRs, 20:215 (R;SE)
Packaging
Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)
Radioactive Waste Disposal
1994 Panel 1 Utilization Plan, 20:252 (R;US)
Risk perception on management of nuclear high-level and transuranic waste storage, 20:311 (R;US)
Radioactive Waste Processing
Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Solid waste operations complex engineering verification program plan, 20:366 (R;US)
Radioactive Waste Storage
Characterization of void volume VOC concentration in vented TRU waste drums - an interim report, 20:261 (R;US)
Criticality safety evaluation for TRU waste in storage at the RWMC, 20:496 (R;US)
Radioassay
A comparison of real-time radiography results and visual characterization results with emphasis on WIPP WAC and TRAMPAC compliance issues, 20:255 (R;US)
Remedial Action
Test plan for the remote conveyance and innovative end effector demonstration, 20:269 (R;US)
Specifications
Performance-based waste acceptance criteria preliminary baseline assumptions, 20:229 (R;US)
Underground Disposal
Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
Underground Storage
Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
Vitrification
Arc melter demonstration baseline test results, 20:268 (R;US)
Baseline tests for arc melter vitrification of INEL buried wastes: Volume 1: Facility description and summary data report, 20:264 (R;US)
Baseline tests for arc melter vitrification of INEL buried wastes: Volume II: Baseline test data appendices, 20:265 (R;US)
Waste Retrieval
Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)

ALS STORAGE RING
See ADVANCED LIGHT SOURCE

ALUMINIA
See ALUMINIUM OXIDES

ALUMINIUM
A practical application of the theory of hyper-complex variables: dielectric and optical response of 3-dimensional arrays of spheres of complex permittivity, 20:2320 (IA;AU)
ALBIOS: an analysis of aluminium biogeochemistry in forested watersheds of North America and Northern Europe, 20:1951 (IA;DE)
Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)
Impact-limiting materials characterization, 20:1119 (IA;JP)
Improved die castings through plasma surface modification, improved sensors and die soldering prevention: Quarterly progress report 1, July 1–September 30, 1994, 20:1112 (R;US)
Oxidation behavior of aluminum nanopowders, 20:1157 (R;US)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)
Soil acidification: its extent, development during the last decades, and causes, 20:1820 (IA;DE;In German)
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)

ALUMINIUM 27 TARGET
Heavy residues from very mass asymmetric heavy ion reactions, 20:2268 (R;US)

ALUMINIUM 28
$^{29}Si(d,^{3}He)^{28}Al$ reaction at 29 MeV, 20:2250 (R;FR)

ALUMINIUM ALLOYS
See also ALUMINIUM BASE ALLOYS
Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)
Development of highly effective neutron shields and neutron absorbing materials, 20:1249 (IA;JP)
Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Tribology and surface mechanical properties of excimer laser nitrided titanium, 20:1158 (R;US)

ALUMINIUM ARSENIDES
Resonant generation of nonequilibrium phonons in GaAs/AlAs quantum wells via intersubband scattering, 20:2306 (R;US)

ALUMINIUM BASE ALLOYS
Summary of irradiation data on U-Al and Li-Al alloys, 20:153 (R;US)
The initial thermo-instability of the Al-Cu-Mg-Ag supersaturated solid solution, 20:1125 (IA;AU)

ALUMINIUM COMPOUNDS
See also ALUMINIUM ARSENIDES
ALUMINIUM NITRATES
ALUMINIUM OXIDES
High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994, 20:1177 (R;US)

ALUMINIUM NITRATES
Clean Salt integrated flowsheet, 20:384 (R;US)

ALUMINIUM OXIDES
Creep behavior in SiC whisker-reinforced alumina composite, 20:1240 (R;US)
Directional solidification of the alumina-zirconia ceramic eutectic system, 20:1233 (R;US)
In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory, 20:1237 (R;US)
Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics, 20:1172 (R;US)

ALUMINUM
See ALUMINIUM

AMERICIUM
The FRAM code: Description and some comparisons with MGA, 20:1331 (R;US)

AMERICIUM ISOTOPES
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

AMES WET OXIDATION PROCESS
See DESULFURIZATION

AMIDES
See also UREA
Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)

AMINES
Photocatalytic degradation of atrazine using TiO_2-impregnated mesh, 20:1371 (R;US)
Photocatalytic destruction of atrazine using TiO_2 mesh, 20:1372 (R;US)
Toxicity and physical properties of atrazine and its degradation products: A literature survey, 20:1369 (R;US)

AMINO ACIDS
See also ALANINES
HEDTA
TRYPTOPHAN
OH radicals induced oxidation of sulfur-containing amino acids. An ESR study, 20:1397 (IA;PL)

AMINO ALCOHOLS
See ALCOHOLS
AMINES

AMINO SUGARS
See AMINES
SACCHARIDES
AMINOGLYCIDES
See AMINES
SACCHARIDES
AMISOL PROCESS
See DESULFURIZATION
AMMONIA
Factors of influence relevant to ammonium release from liquid manure used as a basis for process-technical improvements, 20:1742 (I;DE;In German)
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Preventing atmospheric ammonia emissions: A generator/regulator solution, 20:1704 (R;US)
Synthetic waste chemical mechanism studies, 20:330 (R;US)
Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)
AMOCO CBA PROCESS
See DESULFURIZATION
AMOCO SULFUR RECOVERY PROCESS
See DESULFURIZATION
AMYLUM
See STARCH
ANALCIME
Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)
ANALYSIS (THERMAL)
See THERMAL ANALYSIS
ANGIOGRAPHY
See BIOMEDICAL RADIOGRAPHY
ANIMALS
See also WILD ANIMALS
Status of the flora and fauna on the Nevada Test Site, 1993: Results of continuing basic environmental monitoring, January through December 1993, 20:1789 (R;US)
ANIONS
Liquid chromatographic method for determination of water in soils and the optimization of anion separations by capillary zone electrophoresis, 20:1329 (R;US)
ANL
Energy Technology Division research summary – 1994, 20:924 (R;US)
Physics Division annual report, April 1, 1993–March 31, 1994, 20:2201 (R;US)
ANNIE EVENT
See NUCLEAR EXPLOSIONS
ANODES
Thin flexible intercalation anodes, 20:899 (R;US)
ANSTO
Environmental survey at Lucas Heights Research Laboratories, 1991, 20:1702 (R;AU)
Environmental survey at Lucas Heights Research Laboratories, 1992, 20:1703 (R;AU)
ANTARCTICA
Results of PM_{10} and TSP monitoring at McMurdo Station, Antarctica, 20:1751 (R;US)
Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica, 20:1750 (R;US)
Results of monitoring for PCDDs and PCDFs in ambient air at McMurdo Station, Antarctica, 20:1749 (R;US)
ANTIFERROMAGNETIC MATERIALS
A series of quantum spin models on 3-dimensional lattices, 20:2391 (IA;AU)
ANTIPROTON BEAMS
Multi-batch P-bar production via snap coalescing: A plan to produce ~5× more antiprotons/cycle using mostly existing equipment, 20:1549 (R;US)
ANTIPROTONS
Strange particle and antiproton production in S + nucleus collisions at 200 GeV/nucleon, 20:2269 (R;US)
ANYONS
Equation of state of an anyon gas in a strong magnetic field, 20:2021 (R;FR)
On δ perturbative interactions in the Aharonov-Bohm and Anyon models, 20:1996 (R;FR)
APPARATUS
See EQUIPMENT
APPRAISAL
See COST ESTIMATION
AQUACLAUS PROCESS
See DESULFURIZATION
AQUATIC ECOSYSTEMS
Leakage and accidental releases from Sillamaee waste depository and environmental risk assessment, 20:1859 (R;SE)
AQUEOUS CARBONATE PROCESS
See DESULFURIZATION
AQUIFERS
Anionic co-contaminants and the biogeochemical evolution of aquifer heterogeneity: Technical progress report, 1 August 1993–31 July 1994, 20:1781 (R;US)
Concentrations of tritium and strontium-90 in water from selected wells at the Idaho National Engineering Laboratory after purging one, two, and three borehole volumes, 20:1849 (R;US)
Fundamental quantitative analysis of microbial activity in aquifer bioreclamation, 20:1780 (R;US)
Manipulation of natural subsurface processes: Field research and validation: Interim report, 20:510 (R;US)
Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL, 20:493 (R;US)
Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system, 20:307 (R;US)
ARAB REPUBLIC OF EGYPT
See EGYPTIAN ARAB REPUBLIC
ARALEX PROCESS
See RADIOACTIVE WASTE PROCESSING
ARC FURNACES
Arc melter demonstration baseline test results, 20:268 (R;US)
Baseline tests for arc melter vitrification of INEL buried wastes: Volume 1: Facility description and summary data report, 20:264 (R;US)
Baseline tests for arc melter vitrification of INEL buried wastes: Volume II: Baseline test data appendices, 20:265 (R;US)
ARCHAEOLOGICAL SITES
Electromagnetic scattering from buried objects, 20:1685 (R;US)
ARCHAEOLOGICAL SPECIMENS
Aspect of human food ecology: Development of carbon and nitrogen isotope method, 20:1303 (IA;JP;In Japanese)
Isotopic approach to the provenance study of artifacts, 20:1302 (IA;JP;In Japanese)
New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry, 20:1304 (IA;JP;In Japanese)
ARGENTINA
Atucha 1 Nuclear Power Station, 20:2464 (RA;XA)
National programme and experience on training and qualification for nuclear plant personnel, 20:2465 (RA;XA)
ARGON
X-ray spectroscopy of xenon: Final report, 20:2281 (R;US)
ARGON IONS
Angular and charge state distributions of highly charged ions scattered during low energy surface-channeling interactions with Au(110), 20:2347 (R;US)
Experimental study of interactions of highly charged ions with atoms at keV energies: Progress report, February 16, 1993–April 15, 1994, 20:2288 (R;US)
ARGON METHOD
See ISOTOPE DATING
ARGONNE NATIONAL LABORATORY
See ANL
ARGONOX PROCESS
See COMBINED SOXNOX PROCESSES

ARGUS EVENT
See NUCLEAR EXPLOSIONS
ARIZONA
Baseline risk assessment of ground water contamination at the Monument Valley Uranium Mill Tailings Site, Cane Valley, Arizona: Revision 1, 20:228 (R;US)
ARMS CONTROL
Airborne Multisensor Pod System (AMPS) data access concept, 20:970 (R;US)
CTBT technical issues handbook, 20:1099 (R;US)
Future directions for arms control and nonproliferation: Conference summary, 20:1097 (R;US)
ARMY PERSONNEL
See MILITARY PERSONNEL
AROMATIC COMPOUNDS
See AROMATICS
AROMATICS
See also BENZENE
POLYCYCLIC AROMATIC HYDROCARBONS
Aromatics oxidation and soot formation in flames: Progress report, August 15, 1993–June 30, 1994, 20:1420 (R;US)
ARSENIC
Inhibition of mitotic-specific histone phophorylation by sodium arsenite, 20:1967 (R;US)
ART OBJECTS
See CULTURAL OBJECTS
ARTHUR D LITTLE COAL LIQUEFACTION PROCESS
See COAL LIQUEFACTION
ARTIFICIAL INTELLIGENCE
Learning algorithms for feedforward networks based on finite samples, 20:2554 (R;US)
AS RECYCLING PROCESS
See DESULFURIZATION
ASBESTOS
Floor tile and mastic removal project report, 20:1739 (R;US)
In-place testing summary (1992): Progress report, 20:286 (R;US)
ASH SEPARATORS
See INERTIAL SEPARATORS
ASHES
See also FLY ASH
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)
Solid waste sampling and distribution project: Sampling report #4, 20:62 (R;US)
ASTATINE 211
Astatination of monoclonal antibodies, 20:1889 (R;XJ;In Russian)
ASTATINE ADDITIONS
See ALLOYS
ASTEROIDS
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)
ATGAS PROCESS
See COAL GASIFICATION
ATLANTIC OCEAN
Atlantic interdecadal ocean-atmosphere interaction, 20:1848 (RA;US)
Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)
Interannual variability of north Atlantic Sea surface temperatures, 20:1714 (RA;US)
Low-frequency variation of a zonally localized jet stream: Observation and theory, 20:1717 (RA;US)
On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic, 20:1731 (RA;US)
ATMOSPHERIC CIRCULATION
Air-Water Interactions
Fluctuations in the large-scale atmospheric circulation and ocean conditions associated with the dominant modes of wintertime precipitation variability for the contiguous United States, 20:1730 (RA;US)
On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic, 20:1731 (RA;US)
Potential vorticity dynamics for global scale circulations, 20:1727 (RA;US)
Climate Models
Scaling of saturation amplitudes in baroclinic instability, 20:1734 (RA;US)
Dynamics
Diagnosis of balanced and unbalanced motions in a synoptic-scale baroclinic wave life cycle, 20:1716 (RA;US)
Fluctuations
An observational study of the interaction between the synoptic-scale eddies and the intra-seasonal fluctuations in the atmosphere, 20:1711 (RA;US)
Rossby wave propagation and teleconnections for the Northern Hemisphere summer flow, 20:1713 (RA;US)
The role of eddy transports in climate change, 20:1712 (RA;US)
Transient eddy feedback and low-frequency variability, 20:1732 (RA;US)
Greenhouse Effect
Hydrologic and radiative feedbacks on extratropical transient eddies: Implications of global warming, 20:1720 (RA;US)
The importance of resolution on the response of mid-latitude transients to enhanced CO_2, 20:1733 (RA;US)
Transient and stationary eddies in differing GCM climates, 20:1721 (RA;US)
Transient eddies and low frequency variability in the Northern Hemisphere winter climates of two GCMs, 20:1722 (RA;US)
Instability
Scaling of saturation amplitudes in baroclinic instability, 20:1734 (RA;US)
Mathematical Models
An integrated cloud observation and modeling investigation in support of the ARM Program: Annual technical progress report, November 1, 1993–October 31, 1994, 20:1708 (R;US)
The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)
Monthly Variations
Intraseasonal oscillations and their predictability in a hemispheric barotropic model with seasonal forcing, 20:1735 (RA;US)
On the intra-seasonal variability within the extratropics in a general circulation model and observational data, 20:1729 (RA;US)
Parametric Analysis
Intraseasonal oscillations and their predictability in a hemispheric barotropic model with seasonal forcing, 20:1735 (RA;US)
On the intra-seasonal variability within the extratropics in a general circulation model and observational data, 20:1729 (RA;US)
Regional Analysis
Low-frequency variation of a zonally localized jet stream: Observation and theory, 20:1717 (RA;US)
Seasonal Variations
Climatic feedbacks between stationary and transient eddies, 20:1715 (RA;US)
Climatological features of blocking anticyclones, 20:1726 (RA;US)
Northern hemispheric response to large volcanic eruptions in relation to El Nino - winter case studies, 20:1724 (RA;US)
Predictability of blocking, 20:1738 (RA;US)
Synoptic scale eddies in the Northern Hemisphere summer: A POP analysis, 20:1719 (RA;US)
Stability
An EPV view of the zonal mean distribution of temperature and wind in the extra-tropical troposphere, 20:1736 (RA;US)
Wave-mean flow interaction and the baroclinic adjustment hypothesis, 20:1728 (RA;US)
Temperature Dependence
On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic, 20:1731 (RA;US)
Variations
Atlantic interdecadal ocean-atmosphere interaction, 20:1848 (RA;US)

Maintenance of extratropical low-frequency variabilities in the atmosphere, 20:1737 (RA;US)
Stochastic excitation of low frequency variability in the midlatitude atmosphere, 20:1723 (RA;US)
Transient and stationary eddies in differing GCM climates, 20:1721 (RA;US)
Transient eddies and low frequency variability in the Northern Hemisphere winter climates of two GCMs, 20:1722 (RA;US)

Vortex Flow
Potential vorticity dynamics in the Canadian Climate Centre GCM, 20:1725 (RA;US)

Wave Propagation
Stochastic excitation of low frequency variability in the midlatitude atmosphere, 20:1723 (RA;US)

ATMOSPHERIC PRECIPITATIONS
Application of surface analysis methods to studies of atmospheric deposition in forests, 20:1759 (IA;DE)
Fluctuations in the large-scale atmospheric circulation and ocean conditions associated with the dominant modes of wintertime precipitation variability for the contiguous United States, 20:1730 (RA;US)
Rates of wet, moist and dry deposition in forests: measuring approaches and measuring results, 20:1758 (IA;DE;In German)

ATOM-ATOM COLLISIONS
Molecular dynamics simulation of ion impact phenomena in 3 D nickel lattice, 20:2350 (IA;AU)
Vacuum polarization effects in low-energy muonic atom collisions, 20:2289 (R;XJ)

ATOMIC ABSORPTION SPECTROSCOPY
See ABSORPTION SPECTROSCOPY

ATOMIC BOMBS
See NUCLEAR WEAPONS

ATOMIC DISPLACEMENTS
Time-dependent atomic displacements in solid state diffusion, 20:2315 (IA;AU)
Tracer correlation factor and atomic displacements in solid state diffusion, 20:2351 (IA;AU)

ATOMIC ENERGY
See NUCLEAR ENERGY

ATOMIC EXPLOSIONS
See NUCLEAR EXPLOSIONS

ATOMIC SHELLS
See ELECTRONIC STRUCTURE

ATOMIC WEAPONS
See NUCLEAR WEAPONS

ATOMICS INTERNATIONAL AQUEOUS CARBONATE PROCESS
See DESULFURIZATION

ATOMS
See also MUONIC ATOMS
Parity nonconservation in radioactive atoms: An experimental perspective, 20:2295 (R;US)

AUDITS
Initial evaluation of the Department of Energy Audit Report Tracking System (DARTS), 20:977 (R;US)

AUFWUCHS
Autoradiographic studies of ^{65}Zn adsorption by periphyton, 20:1908 (R;US)

AURORAE
A technique for calculating the field aligned conductance and ionospheric Pedersen conductivity from high altitude electric and magnetic field data, 20:2425 (R;SE)

AUSTENITIC STEELS
An austenitic steel for fuel cladding tubes and core components of LMFBR's with high ductility after neutron irradiation, 20:1152 (R;DE;In German)

AUSTRALIA
See also VICTORIA
Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994, 20:189 (R;US)

AUSTRALIAN MOATA REACTOR
See MOATA REACTOR

AUTOMOBILE EFFICIENCY STANDARDS
See AUTOMOBILES
STANDARDS

AUTOMOBILES
Car power supply with fast synchronous generator, 20:1082 (I;DE;In German)
EAGLES 1.1: A microcomputer software package for analyzing fuel efficiency of electric and gasoline vehicles, 20:1072 (R;US)
Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165), 20:1068 (I;JP;In Japanese)

AUTORADIOGRAPHY
Application of track autoradiography to determination of nitrogen distribution in surface layers of steels subjected to LPCVD and PVD processes and thermo-chemical treatment, 20:1485 (IA;PL)

AUXILIARY SYSTEMS
Anti-foam System design description, 20:412 (R;US)

AVG PROCESS
See COAL GASIFICATION

AWAY-FROM-REACTOR STORAGE
Away-from-reactor storage concepts and their implementation: Proceedings of a technical committe meeting held in Vienna, 15-18 March 1993, 20:192 (R;XA)
Spent fuel management and disposal programme (SFMDP) strategy for the Czech Republic, 20:193 (RA;XA)

AZOTOBACTER
Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, April 30, 1991–April 30, 1992, 20:1847 (R;US)

B

B MESONS
A preliminary, precise measurement of the average B hadron lifetime, 20:2181 (R;US)
Charmonium production, b quark and B meson production and $b\bar{b}$ correlations at CDF, 20:2152 (R;US)
Measurement of the B cross section at CDF via B semileptonic decays, 20:2151 (R;US)
Measurement of the angle gamma, 20:2031 (R;FR)
Measurement of the average lifeetime of B hadrons at SLD, 20:2199 (R;US)
Measurement of the polarization in the decay $B^0 \rightarrow J/\psi K^{*0}$ in $\bar{p}p$ collisions at $\sqrt{s}$ = 1.8 TeV, 20:2150 (R;US)
Production and lifetime measurements for B_s^0 with the LEP DELPHI detector, 20:2196 (R;FR;In French)

BACTERIA
See also AEROBACTER
AZOTOBACTER
COLIFORMS
SULFATE-REDUCING BACTERIA
ZYMOMONAS MOBILIS
A definition of the domains Archaea, Bacteria and Eucarya in terms of small subunit ribosomal RNA characteristics, 20:1863 (R;US)
Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, 20:1846 (R;US)

BAFFLES
Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants, 20:755 (R;FR;In French)

BALL BEARINGS
A study of mechanical processing damage in brittle materials: Annual progress report, April 1, 1990–March 31, 1991, 20:1175 (R;US)

BALLISTIC MISSILE DEFENSE
Issues in the flight qualification of a space power reactor, 20:793 (R;US)

BANEBERRY EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

BANKS
See COMMERCIAL BUILDINGS

BARIUM COMPOUNDS
See also BARIUM OXIDES
The influence of cationic and anionic surfactants on ball milled barium ferrite, 20:1178 (IA;AU)
BARIUM OXIDES
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Josephson behaviour and flux trapping effects in YBCO step edge junctions, 20:2378 (IA;AU)
Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Neutron diffraction study of the magnetic ordering of $BaCuO_{2+x}$, 20:1174 (R;US)
Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites., 20:1228 (IA;UA;In Russian)
Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)
BASALT
Nondestructive neutron activation analysis of basalts, 20:1332 (R;TH;In Thai)
BATTELLE PACIFIC NORTHWEST LABORATORIES
Characterization and monitoring of 300 Area Facility liquid waste streams: Status report, 20:305 (R;US)
Cooperative study of clinical benefits from use of the fully portable blood irradiator, 20:932 (R;US)
Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993, 20:298 (R;US)
BATTERIES (ELECTRIC)
See ELECTRIC BATTERIES
BCL PROCESS
Brown coal liquefaction project.: Technical summary, 20:42 (I;JP;In Japanese)
Development of brown coal liquefaction technology. 2.: Economical performance investigation on the brown coal liquefaction process, 20:43 (I;JP;In Japanese)
BCR PROCESS
See COAL GASIFICATION
BEAM BUNCHING
Derivation of coupling impedance from the wake potential of a finite bunch, 20:1533 (R;US)
Instrumentation for on-line mountain range displays, 20:1543 (R;US)
BEAM COOLING
Workshop on beam cooling and related topics: Proceedings, 20:1547 (R;XC)
BEAM DYNAMICS
See also BEAM BUNCHING
BETATRON OSCILLATIONS
Algorithms for orbit control on SPEAR, 20:1608 (R;US)
BEAM EMITTANCE
Emittance growth due to negative-mass instability above transition, 20:1532 (R;US)
BEAM MONITORS
Implementation of Beam-Loss Monitor systems for the SSC, 20:1597 (R;US)
Instrumentation for on-line mountain range displays, 20:1543 (R;US)
Noninterceptive transverse emittance measurement diagnostic for an 800 MeV H^- transport line, 20:1589 (R;US)
BEAM OPTICS
Moment approach to high-order accelerator beam optics, 20:1539 (R;US)
BEAM PERVEANCE
See BEAM EMITTANCE
BEAM PROFILES
Development of a simple beam monitor at FNRF, 20:1634 (IA;TH)
BEAM TRANSPORT
Feasibility study of aluminum beam tube for the collider: An option for no-coating and no-liner, 20:1596 (R;US)
Study of the many-dimensional transverse phase-space distributions of intense ion beams, 20:1550 (R;DE;In German)
The 12-GeV/c beam transfer and absorber lines for the Superconducting Super Collider, 20:1540 (R;US)
BEAM WIDTHS
See BEAM PROFILES
BEAM-PLASMA SYSTEMS
Dynamics of structure formation in nonequilibrium systems (Wave Media), 20:2413 (R;UA;In Russian)
BEAUTY PARTICLES
See also B MESONS
Charmonium production, b quark and B meson production and $b\bar{b}$ correlations at CDF, 20:2152 (R;US)
BELGIUM
Survey of programme and experience on training and qualification for nuclear power plant personnel in Belgium, 20:2466 (RA;XA)
BENCHMARKS
Solutions of TEAM problems 13 and 20 using a volume integral formulation, 20:2525 (R;US)
BENHAM EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
BENZENE
Measuring technique of volatile hydrocarbons: Subproject: process spectrometry based on dynamical derivative technique. Status report, 20:1664 (I;DE;In German)
BENZOFURANS
Results of monitoring for PCDDs and PCDFs in ambient air at McMurdo Station, Antarctica, 20:1749 (R;US)
BENZOPYRENE
Characterizing and imaging carcinogenic materials using ion beams and lasers: Progress report, 20:1949 (R;US)
Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures, 20:1948 (R;US)
BENZOQUINONES
Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes, 20:1370 (R;US)
BERGBAUFORSCHUNG-FOSTER WHEELER PROCESS
See DESULFURIZATION
BERKELIUM ADDITIONS
See ALLOYS
BERYLLIUM
Results of the radiological and beryllium verification survey at the Peek Street Site, Schenectady, New York (SY001V), 20:505 (R;US)
Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V), 20:504 (R;US)
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)
BERYLLIUM 11
Exclusive and restricted inclusive reactions involving the ^{11}Be one-neutron halo, 20:2248 (R;FR)
BERYLLIUM 9 TARGET
Heavy residues from very mass asymmetric heavy ion reactions, 20:2268 (R;US)
BERYLLIUM MODERATORS
See BERYLLIUM
BETA BACKSCATTERING GAGES
See RADIOMETRIC GAGES
BETA BEAMS (ELECTRONS)
See ELECTRON BEAMS
BETA DECAY
See also BETA-MINUS DECAY
Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994, 20:2276 (R;US)
BETA PARTICLES
Threshold-like dose response of skin carcinogenesis by repeated beta irradiation in mice, 20:1926 (RA;JP;In Japanese)
BETA-MINUS DECAY
First measurements of the beta decay into bound states of the electron: $^{163}_{66}Dy^{66+} \rightarrow {}^{163}_{67}Ho^{66+}$ + anti ν_e, 20:2225 (R;DE;In German)

BETATRON OSCILLATIONS
A normal form approach to the theory of nonlinear betatronic motion, 20:1531 (R;XC)
BETTIS
1993 Effluent and environmental monitoring report for the Bettis Atomic Power Laboratory, Pittsburgh Site, 20:468 (R;US)
BF-WF PROCESS
See DESULFURIZATION
BINARY ALLOY SYSTEMS
The λ-bar exponent for conservative systems, 20:2298 (R;XA)
BIOADSORBENTS
Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report, 20:1362 (I;DE;In German)
BIOCENOSES
See ECOSYSTEMS
BIOGAS
See METHANE
BIOGEOCENOSES
See ECOSYSTEMS
BIOLOGICAL EFFECTS
Trends in, and current state of, forest damage surveying, 20:1954 (IA;DE;In German)
BIOLOGICAL MATERIALS
Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)
BIOLOGICAL REACTORS
See BIOREACTORS
BIOMASS
Renewable raw materials: Balance of research promotion, 20:618 (I;DE;In German)
BIOMASS CONVERSION PLANTS
Control and regulation of biomass conversion plants: Adaptive regulation of biogas reactors according to total concentration of volatile fatty acids. Control models and implementation, 20:625 (I;DK;In Danish)
Full scale enzymatic hydrolysis, 20:624 (R;DK;In Danish)
BIOMASS PLANTATIONS
Perennial grass production for biofuels: Soil conversion considerations, 20:630 (R;US)
BIOMEDICAL RADIOGRAPHY
Design of neutron beams at the Argonne Continuous Wave Linac (ACWL) for boron neutron capture therapy and neutron radiography, 20:1871 (R;US)
Quality control handbook in mammography: Radiation Protection - Booklet 2, 20:1924 (R;NO;In Norwegian)
Today and tomorrow of intravenous coronary angiography programme in Japan, 20:1878 (IA;JP)
BIOREACTORS
A low energy continuous reactor separator for the production of ethanol from corn grits/starch and biomass streams: 2nd Quarterly report, August 1–October 15, 1994, 20:620 (R;US)
BIOTHERMOHOL PROCESS
See THERMOCHEMICAL PROCESSES
BIRDS
Toxicological benchmarks for wildlife: 1994 Revision, 20:457 (R;US)
BISMUTH BASE ALLOYS
51st (Spring 1994) Meeting on Cryogenics and Superconductivity, 20:1074 (I;JP;In Japanese)
BISMUTH COMPLEXES
Fabrication and properties of long Bi2223 Ag-sheathed superconducting tapes, 20:1120 (IA;AU)
BISMUTH COMPOUNDS
See also BISMUTH OXIDES
Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)
BISMUTH OXIDES
About influence of silver additions on superconducting properties of the HTSC ceramic, 20:1226 (IA;UA;In Russian)
High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
Microstructural and superconducting properties of Bi(2223)/Ag tapes during heat treatment process, 20:1193 (IA;AU)
Microstructure development and phase transformation of Ag-sheathed BI-2223 tapes, 20:1192 (IA;AU)
Oxygen annealing of Bi_2 Sr_2 Ca_1 Cu_2 O_{8+x} single crystals, 20:1204 (IA;AU)
Superconducting, kinetic and structural properties of the quenched ceramic samples Bi, Pb-Sr-Ca-Cu-O, 20:1224 (IA;UA;In Russian)
Superconductivity of Fe-substituted Bi_2 Sr_2 Ca_1 Cu_2 O_x single crystals, 20:1218 (IA;AU)
The relation between ultrasonic properties and the critical temperature in Fe doped BSCCO, 20:1203 (IA;AU)
Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal, 20:2384 (R;US)
BISMUTH URANATES
See BISMUTH COMPOUNDS
BITUMINOUS COAL
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Investigation of coal structure: Final report, 20:54 (R;US)
BLADES (TURBINES)
See TURBINE BLADES
BLENDERS
See MIXERS
BLOCKING
See CHANNELING
BLOOD
See also BLOOD PLASMA
Cooperative study of clinical benefits from use of the fully portable blood irradiator, 20:932 (R;US)
BLOOD PLASMA
The effects of gamma irradiation on blood and its components, 20:1899 (IA;TH)
BLOOD SERUM
Optimized nuclear techniques and survey of neonatal chemical hypothyroidism in iodine deficient areas in Thailand - a preliminary report, 20:1881 (IA;TH)
TSH IRMA of dried blood spots, 20:1882 (IA;TH;In Thai)
BLOWERS
On the thermal characteristics of diesel particulate filter, 20:1070 (IA;JP;In Japanese)
BOILERS
180 MW demonstration of advanced tangentially-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers: Technical progress report, First quarter 1991, 20:85 (R;US)
180 MW demonstration of advanced tangentially-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers: Technical progress report, Third quarter 1992, 20:86 (R;US)
500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide emissions from coal-fired boilers, 20:80 (R;US)
Automated boiler combustion controls for emission reduction and efficiency improvement: Quarterly progress report, February 14, 1994–May 14, 1994, 20:91 (R;US)
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994, 20:738 (R;US)
BOILING WATER COOLED AND MODERATED REACTOR
See BWR TYPE REACTORS
BOM-ERDA PROCESS
See DESULFURIZATION
BONE MARROW
The SCID-hu mouse and its application to human radiation biology: Analysis of sensitivity to X-irradiation using a bone marrow model, 20:1933 (RA;JP;In Japanese)

BONE TISSUES
An application of X-Ray computerized tomography for examining the internal features of materials, 20:2303 (IA;AU)
Quantitative in vivo elemental analysis using X-ray fluorescence and scattering techniques. Applications to cadmium, lead and bone mineral, 20:1891 (R;SE)
BONNEVILLE POWER ADMINISTRATION
Lower Yakima Valley Wetlands and Riparian Restoration Project: Final environmental assessment, 20:638 (R;US)
BOOSTERS (PARTICLE)
See PARTICLE BOOSTERS
BOREHOLES
VTT test borehole for bedrock investigations, 20:1841 (R;FI)
BORON
INEL BNCT Research Program Annual Report 1993, 20:1874 (R;US)
BORON ALLOYS
A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
BORON NITRIDES
A facility with induction furnace for boron nitride production, 20:1360 (IA;PL)
BOROSILICATE GLASS
ANL Technical Support Program for DOE Environmental Restoration and Waste Management: Annual report, October 1992–September 1993, 20:216 (R;US)
BOROSILICATES
See BOROSILICATE GLASS
BOSE-EINSTEIN GAS
Asymptotics for the Kummer function of Bose plasmas, 20:2003 (R;AU)
Magnetized pair Bose gas: relativistic superconductor, 20:2398 (R;AU)
Statistical mechanics of relativistic spin-1 bosons in a magnetic field, 20:2072 (R;AU)
Statistical mechanics of the magnetized pair Bose gas, 20:2069 (R;AU)
Two dimensional Bose plasma in a magnetic field, 20:2428 (R;AU)
BOTTOM PARTICLES
See BEAUTY PARTICLES
BOUND STATE
Existence domains and some properties of a particle bound state in fields with homogeneous dependence of its potential energy on coordinates, 20:2059 (R;XJ;In Russian)
Strong Coulomb coupling in relativistic quantum constraint dynamics, 20:2092 (R;FR)
BOUNDARY LAYERS
Large eddy simultations of the atmospheric boundary layer east of the Colorado Rockies, 20:1764 (R;US)
BOUNDARY VALUE PROBLEMS
See BOUNDARY-VALUE PROBLEMS
BOUNDARY-VALUE PROBLEMS
Stable parallel elimination for boundary valve ODEs, 20:2526 (R;US)
BOXCAR EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
BPA
See BONNEVILLE POWER ADMINISTRATION
BRACKISH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
BRAIN
Nuclear medicine. Czech special bulletin. No. 2, 20:1880 (I;CZ;In Czech)
BRAZIL
The Treaty for the prohibition of nuclear weapons in Latin America and the Caribbean (Tlatelolco Treaty), 20:1096 (R;XA;In Arabic, Chinese, English, French)
Training and qualification of nuclear power plant personnel in Brazil, 20:2467 (RA;XA)
BRAZILIAN CNEN
Technical-scientific production of IPEN - 1992, 20:2572 (I;BR;In Portuguese)
BREAKWATERS
See DAMS
BREASTS
See MAMMARY GLANDS
BREMSSTRAHLUNG (MAGNETIC)
See SYNCHROTRON RADIATION
BRIDGES
Damage detection and health monitoring of operational structures, 20:1445 (R;US)
BRIDGES (ELECTRIC)
See ELECTRIC BRIDGES
BRINES
Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994, 20:128 (R;US)
BROMAMINES
See AMINES
BRONCO EVENT
See NUCLEAR EXPLOSIONS
BROOKHAVEN AGS
A safety system for personnel and equipment protection at the AGS and RHIC, 20:1545 (R;US)
BROOKHAVEN RHIC
A safety system for personnel and equipment protection at the AGS and RHIC, 20:1545 (R;US)
Gas cooled leads: This report consists of three independent parts, Part 1 covers the theory, Parts 2 and 3 present specific lead designs: Revision, 20:1542 (R;US)
Technology transfer for industrial production of superconducting magnets for the RHIC project at BNL, 20:1544 (R;US)
BROWN COAL
See also LIGNITE
Microbial transformation of inorganic and organic sulphur compounds, 20:70 (I;DE;In German)
Raw material conservation report of Lower Saxony 1993, 20:1019 (I;DE;In German)
BROWN COAL LIQUEFACTION PROCESS
See BCL PROCESS
BROWNIAN MOVEMENT
Moments of inertia and the shapes of Brownian paths, 20:2022 (R;FR)
BUBIAG-DIDIER PROCESS
See COAL GASIFICATION
BUILDING (CONSTRUCTING)
See CONSTRUCTION
BUILDING CODES
Radiological design guide, 20:1455 (R;US)
BUILDING MATERIALS
See also CEMENTS
CONCRETES
Raw material conservation report of Lower Saxony 1993, 20:1019 (I;DE;In German)
Reduction of health-affecting ultra-fine dusts by automatically controlled water addition during the application of dry construction materials. Main phase: Final report, 20:77 (I;DE;In German)
Static corrosion of construction materials exposed to superphosphoric acid made from various sources of phosphate rock, 20:1104 (R;US)
The Re-used House - energy analysis of the production: An evaluation of the difference in energy consumption in connection with the re-used house and a conventional building, 20:1017 (R;DK;In Danish)
BUILDINGS
See also COMMERCIAL BUILDINGS
CONTAINMENT BUILDINGS
GREENHOUSES
OFFICE BUILDINGS
RESIDENTIAL BUILDINGS
A Sandia National Laboratories decontamination and demolition success story, 20:514 (R;US)
Estimating the impacts of federal efforts to improve energy efficiency: The case of buildings, 20:1013 (R;US)
Evaluation of near-field earthquake effects, 20:1456 (R;US)

Indoor Environment Program, 1993 annual report, 20:1024 (R;US)
Load test of the 272E Building high bay roof deck and support structure, 20:523 (R;US)
Load test of the 3701D Building roof deck and support structure, 20:524 (R;US)
Load test of the 3790 Building Roof Deck and Support Structure, 20:525 (R;US)
Low energy program 1990-2000 within the Energy Ministry Research Programs: Working report August 1991, 20:1028 (R;DK;In Danish)
Raw material conservation report of Lower Saxony 1993, 20:1019 (I;DE;In German)
The design and evaluation of three advanced daylighting systems: Light shelves, light pipes and skylights, 20:1021 (R;US)
Windows of wood, plastic or aluminium: Material and design requirements, advice for tender, construction management and takeover, 20:1018 (I;DE;In German)

BUILDINGS (CONTAINMENT)
See CONTAINMENT BUILDINGS

BULGARIA
A review of the technology and experience of spent nuclear fuel storage. Alternatives for the problem of spent fuel in Bulgaria, 20:280 (I;BG)
Implementation of systematic training approach in Kozloduy Training Centre - Current situation. Presentation of Bulgaria, 20:2496 (RA;XA)
Principles and criteria for creation of a concept for national radwaste repository, 20:277 (I;BG)
Research procedure and criteria for analysis and choice of variants for construction of national radioactive waste repository, 20:278 (I;BG)
Site selection procedure for high level radioactive waste disposal in Bulgaria, 20:279 (I;BG)

BUNCHING (BEAM)
See BEAM BUNCHING

BURNER FUEL OIL
See HEATING OILS

BURNERS
500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide emissions from coal-fired boilers, 20:80 (R;US)

BURSA OF FABRICIUS
See BIRDS

BUSINESS
Prosperity Games prototyping with the American Electronics Association, March 8–9, 1994, 20:1050 (R;US)

BUTENES
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993), 20:31 (R;US)

BUTYLENES
See BUTENES

BWR TYPE REACTORS
See also TVO-1 REACTOR
TVO-2 REACTOR
On the prediction of flooding phenomenon with the Cathare code, 20:748 (R;FR)
Risk impact of BWR technical specifications requirements during shutdown, 20:880 (R;US)
The effects of aging on BWR core isolation cooling systems, 20:878 (R;US)

BY-PRODUCTS
Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994, 20:69 (R;US)

C

C CODES
CHEMKIN2: General Gas-Phase Chemical Kinetics, 20:2538 (CM;US)
Status of CFDLIB performance tests on the T3D, 20:1475 (R;US)

C REACTOR
Project 8980, Savannah River Plant, 105-C power calculator, 20:825 (R;US)

CABLES (ELECTRIC)
See ELECTRIC CABLES

CABRIOLET EVENT
See NUCLEAR EXPLOSIONS

CADARACHE RAPSODIE REACTOR
See RAPSODIE REACTOR

CADMIUM COMPOUNDS
See also CADMIUM SELENIDES
CADMIUM SULFIDES
CADMIUM TELLURIDES
Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)

CADMIUM SELENIDES
Heterojunctions of Cd Se and amorphous silicon, 20:1272 (IA;AU)

CADMIUM SULFIDES
Electrical and photoelectrochemical characterization of CdS particulate films by scanning electrochemical microscopy, scanning tunneling microscopy, and scanning tunneling spectroscopy, 20:2311 (R;US)

CADMIUM TELLURIDE SOLAR CELLS
Polycrystalline $CuInSe_2$ and CdTe PV solar cells: Annual subcontract report, 15 April 1993–14 April 1994, 20:690 (R;US)
Thin-film cadmium telluride photovoltaic cells: Final subcontract report, 1 November 1992–1 January 1994, 20:688 (R;US)

CADMIUM TELLURIDES
Carbon and oxygen analysis in MOCVD grown HgCdMnTe and AlGaAs by charged particle activation, 20:1313 (IA;AU)
Thin-film cadmium telluride photovoltaic cells: Final subcontract report, 1 November 1992–1 January 1994, 20:688 (R;US)

CALABASH EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

CALCIUM 40
Multiphonon excitations in nuclei built with giant resonances, 20:2211 (R;FR)

CALCIUM COMPOUNDS
See also CALCIUM OXIDES
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)
Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)

CALCIUM FLUORIDES
Accumulated photon echoes in Nd^{3+}-doped CaF_2 and disordered CaF_2-YF_3 crystals, 20:2332 (IA;AU)

CALCIUM OXIDES
High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)
Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal, 20:2384 (R;US)

CALCULATIONS (2-DIMENSIONAL)
See TWO-DIMENSIONAL CALCULATIONS

CALCULATIONS (COMPUTER)
See COMPUTER CALCULATIONS

CALIFORNIUM ADDITIONS
See ALLOYS

CALORIMETERS
Calorimetric low-temperature detectors on semiconductor base for the energy-resolving detection of heavy ions, 20:1629 (R;DE;In German)

CALORIMETERS (PARTICLE)
See SHOWER COUNTERS

CALORIMETRIC DOSEMETERS
A cryogenic dose calorimeter for pulsed radiographic accelerators, 20:1651 (R;US)
CAM
See COMPUTER-AIDED MANUFACTURING
CANADA
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2498 (RA;XA)
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2468 (RA;XA)
Training of nuclear power plant personnel in Canada, 20:2497 (RA;XA)
CANCER
See NEOPLASMS
CANISTERS
See CONTAINERS
CANNIKIN EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
CANONICAL EQUATIONS
See DIFFERENTIAL EQUATIONS
CANONICAL QUANTUM FIELD THEORY
See LAGRANGIAN FIELD THEORY
CAPACITORS
Three-dimensional image processing for acoustic microscopy, 20:1497 (R;US)
CAPSULES
Development of irradiation capsule for nuclear research reactor using aromatic polyether (BEK), 20:862 (R;JP;In Japanese)
Monthly progress report heat source technology programs, June 1994, 20:612 (R;US)
CARBAMIDE
See UREA
CARBAZOLES
Photophysical processes on triplet states and radical ions in pure and molecularly doped polymers, 20:1376 (R;US)
CARBON
See also DIAMONDS
FULLERENES
GRAPHITE
Electron energy-loss spectroscopy study of thermal annealing of amorphous hydrogenated carbon, 20:1261 (IA;AU)
Electronic structure of graphite, diamond-like and graphitic amorphous carbon, 20:1259 (IA;AU)
Fabrication and characterisation of thin film tetrahedral amorphous carbon, 20:1256 (IA;AU)
Flow and multifragmentation in nuclear collisions at intermediate energies, 20:2271 (R;US)
Heavy residues from very mass asymmetric heavy ion reactions, 20:2268 (R;US)
Surface plasmon observed for carbon nanotubes, 20:2345 (R;AU)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)
Thin flexible intercalation anodes, 20:899 (R;US)
CARBON 12 TARGET
The properties of nucleon clusters production in (p, d) + Ta and (p, d) + C interactions over energy range from 4.2 to 10 GeV/c per nucleon, 20:2263 (R;XJ;In Russian)
CARBON 13 TARGET
The $^{13}C(e,p_{0,1})^{12}B$ differential cross section, 20:2275 (R;AU)
CARBON DIOXIDE
Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)
Cryogenic separation of CO_2 from the flue gas of conventional coal-fired power plants, 20:734 (R;US)
Direct effects of atmospheric CO_2 enrichment on plants and ecosystems: An updated bibliographic data base, 20:1968 (R;US)
Do we need a tax on energy or CO_2?, 20:919 (I;DE;In German)
Emissions of greenhouse gases in the United States: 1987–1992, 20:1705 (R;US)
Gasification combined cycle: Carbon dioxide recovery, transport, and disposal, 20:59 (R;US)
Measurement of diesel exhaust particulate by using CO2 conversion.: Separating measure for volatile components and total soot by heating collection filter, 20:1071 (IA;JP;In Japanese)
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
CARBON DIOXIDE ACCEPTOR PROCESS
See COAL GASIFICATION
CARBON DIOXIDE LASERS
Approach to compact terawatt CO_2 laser system for particle acceleration, 20:1516 (R;US)
CARBON MONOXIDE
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica, 20:1750 (R;US)
[Model catalyst studies of active sites and metal-support interactions on vanadia and vanadia-supported catalysts], 20:1341 (R;US)
CARBON NITRIDES
Formation of iron carbide-nitrides by mechnochemical reaction between iron and organic H(CN)- ring compounds, 20:1180 (IA;AU)
Growth and properties of carbon nitride thin films, 20:1215 (IA;AU)
Investigation of carbon-nitride depositions produced by high energy density discharge in nitrogen gas atmosphere, 20:1216 (IA;AU)
CARBON OXIDE SULFIDE
See CARBON OXYSULFIDE
CARBON OXYSULFIDE
Unknown plant de-construction hazard – Toxic COS and CS_2 gas from torch cutting of pipe, 20:613 (R;US)
CARBON STEELS
Analysis/control of in-bed tube erosion phenomena in the fluidized bed combustion (FBC) system, 20:1490 (R;US)
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)
Electrochemical corrosion studies on a selected carbon steel for application in nuclear waste disposal containers: Influence of radiolytic products on corrosion in brines, 20:1153 (R;DE)
CARBON SULFIDES
Unknown plant de-construction hazard – Toxic COS and CS_2 gas from torch cutting of pipe, 20:613 (R;US)
CARBON TETRACHLORIDE
Combining innovative technology demonstrations with dense nonaqueous phase liquids cleanup, 20:1843 (R;US)
CARBONYL SULFIDE
See CARBON OXYSULFIDE
CARCINOGENESIS
See also LEUKEMOGENESIS
Extracellular matrix in carcinogenesis, 20:1935 (RA;JP;In Japanese)
Influence of dose-rate on tumorigenesis in mice irradiated with gamma-rays from cesium 137, 20:1925 (RA;JP;In Japanese)
P53 in differentiation of thyroid cancer, 20:1932 (RA;JP;In Japanese)
Radiation and offspring cancer, 20:1928 (RA;JP;In Japanese)
Roles of gap junctions and tight junctions in the development of liver cancer and metastatic tumors, 20:1934 (RA;JP;In Japanese)
Suppression of radiation-induced in vitro carcinogenesis by ascorbic acid, 20:1939 (RA;JP;In Japanese)
TL transgenic mouse strains, 20:1930 (RA;JP;In Japanese)
The SCID-hu mouse and its application to human radiation biology: Analysis of sensitivity to X-irradiation using a bone marrow model, 20:1933 (RA;JP;In Japanese)
Threshold-like dose response of skin carcinogenesis by repeated beta irradiation in mice, 20:1926 (RA;JP;In Japanese)

CARCINOGENS
GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
CARL STILL PROCESS
See DESULFURIZATION
CARLSON METHOD
See DISCRETE ORDINATE METHOD
CARPETBAG EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
CARS SPECTROSCOPY
See RAMAN SPECTROSCOPY
CASCADE THEORY
Regge theory inspired model on nuclear destruction in high energy nucleus-nucleus interactions, 20:2231 (R;XJ)
CASKS
See also SPENT FUEL CASKS
Extension of Fakir, Kahina, a computer code of kinsfolk actinides heat irradiation neutron and activity, 20:188 (R;FR)
Heat transfer tests by slice model of high performance spent fuel shipping cask, 20:1438 (IA;JP)
Operational and safety aspects of vitrified waste casks, 20:274 (IA;JP)
Thermal test and analysis for transporting vitrified high-level radioactive wastes, 20:1437 (IA;JP)
Thermal test and analysis of a spent fuel storage cask, 20:207 (IA;JP)
CAT-OX PROCESS
See DESULFURIZATION
CATACARB CARBON DIOXIDE REMOVAL PROCESS
See DESULFURIZATION
CATACARB PROCESS
See DESULFURIZATION
CATALYSIS
See also HETEROGENEOUS CATALYSIS
Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
CATALYSTS
See also ELECTROCATALYSTS
Bench-Scale Experiments
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Chemical Preparation
The economical production of alcohol fuels from coal-derived synthesis gas: Eleventh quarterly technical progress report, April 1, 1994–June 30, 1994, 20:33 (R;US)
Combustion
Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)
Cuprates
Anisotropic quantum spin fluid and anisotropic quantum spin glass formation in La-cuprate-based catalysts for phenol oxidation, 20:1351 (IA;PL)
Decomposition
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Dispersions
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
Exhaust Gases
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Fuel-Air Ratio
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Hazardous Materials
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Internal Combustion Engines
Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)
Metals
Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)
Molybdenum Base Alloys
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
Palladium
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Performance Testing
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Catalysts and process developments for two-stage liquefaction: First quarterly technical progress report No. 52, October 1, 1991–December 31, 1991, 20:19 (R;US)
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Novel catalysts for methane activation: Quarterly report No. 3, April 1, 1993–June 30, 1993, 20:631 (R;US)
Novel catalysts for methane activation: Quarterly report No. 7, April 1, 1994–June 30, 1994, 20:632 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993), 20:29 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993), 20:31 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992), 20:26 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 23: Quarterly technical progress report for third quarter fiscal year 1992 (April 1–June 30, 1992), 20:27 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992), 20:28 (R;US)
Platinum
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Poisoning
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Refractory Metal Compounds
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
Research Programs
[Model catalyst studies of active sites and meta L support interactions on vanadia and vanadia-supported catalysts], 20:1342 (R;US)
[Model catalyst studies of active sites and metal-support interactions on vanadia and vanadia-supported catalysts], 20:1341 (R;US)
Rhodium
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Sorptive Properties
Cluster reactions: An approach to understanding the fundamentals of heterogeneous catalysis, 20:1345 (R;US)
Specific Surface Area
Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)
Sulfur Compounds
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
CATALYTIC-IFP AMMONIA SCRUBBING PROCESS
See DESULFURIZATION
CATAPHORESIS
See ELECTROPHORESIS

CATION EXCHANGE CAPACITY
See ION EXCHANGE
CAUCHY PROBLEM
Behaviour at X=±∞ of solutions to a predator-prey model, 20:2011 (R;XA)
CBA PROCESS
See DESULFURIZATION
CCD
See CHARGE-COUPLED DEVICES
CDF
See FERMILAB COLLIDER DETECTOR
CELL GROWTH (PLANT)
See PLANT CELLS
CELL WALL
Structural studies of complex carbohydrates of plant cell walls: Progress report, December 15, 1990–December 14, 1991, 20:1893 (R;US)
CELLS (BACTERIAL)
See BACTERIA
CELLS (PLANT)
See PLANT CELLS
CELLULOSE
Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, April 30, 1991–April 30, 1992, 20:1847 (R;US)
Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, 20:1846 (R;US)
CEMENTS
Phase III (full scale) agitated mixing test plan, 20:363 (R;US)
Saltcrete formulation, 20:313 (R;US)
CENTAURO-TYPE EVENTS
Search for Centauro events in the DO Detector at Fermilab collider, 20:2155 (R;US)
CENTRAL HEATING PLANTS
Microbial growth in district heating pipes - preliminary investigation, 20:1061 (R;DK;In Danish)
CENTRAL RECEIVERS
Large scale maximum concentration central receiver systems (SOLCOM I 1994.), 20:681 (IA;IL)
CENTRAL REGION
See USA
CENTRIFUGAL SEPARATORS
See INERTIAL SEPARATORS
CENTRIFUGE ENRICHMENT PLANTS
Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3-70): Volume 2, Public comments and NRC response, 20:150 (R;US)
CENTRIFUGES
Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)
CERAMICS
A study of mechanical processing damage in brittle materials: Progress report, 20:1670 (R;US)
Ceramem filters for removal of particles from hot gas streams, 20:60 (R;US)
Cost-effective ceramics program in the United States, 20:1173 (R;US)
Piezoelectric ceramic/polymer composites for dumping of mechanical vibrations, 20:1197 (IA;AU)
The mechanical behavior of surface-modified ceramics: Final report, June 1, 1990–May 31, 1994, 20:1176 (R;US)
CERCLA
See US SUPERFUND
CERIUM OXIDES
Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1993–June 30, 1993, 20:65 (R;US)
Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:66 (R;US)
CERN II SYNCHROTRON
See CERN SPS SYNCHROTRON
CERN SPS SYNCHROTRON
A normal form approach to the theory of nonlinear betatronic motion, 20:1531 (R;XC)
CERNAVODA-1 REACTOR
Cernavoda NPP operations training programs, 20:2505 (RA;XA)
CESIUM
Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants, 20:317 (R;US)
CESIUM 137
Comparison of methods for developing contaminant-particle size distributions for suspended sediment, 20:227 (R;US)
Cs^{137} soil-to-plant transfer factor, 20:1799 (I;BR)
CESIUM COMPOUNDS
Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)
CESIUM ISOTOPES
See also CESIUM 137
Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993, 20:2221 (R;US)
Parity nonconservation in radioactive atoms: An experimental perspective, 20:2295 (R;US)
CEYLON
See SRI LANKA
CHANNELING
See also ION CHANNELING
Transverse microanalysis of 2.5 MeV H^+ damage in diamond, 20:2355 (IA;AU)
CHARGE-COUPLED DEVICES
Performance of the SLD CCD pixel vertex detector and design of an upgrade, 20:1656 (R;US)
CHARGED PARTICLES
See also ALPHA PARTICLES
BETA PARTICLES
Dynamics of nonadiabatic charged particles in the magnetic dipole field with imposed homogeneous magnetic field, 20:2545 (R;XJ;In Russian)
Multicomponent double layers and selective acceleration of charged particles, 20:2424 (R;SE)
CHARGED-PARTICLE ACTIVATION
See CHARGED PARTICLES
CHARGING MACHINES (REACTOR)
See REACTOR CHARGING MACHINES
CHARM PARTICLES
See also CHARMED BARYONS
Triggers for a high sensitivity charm experiment, 20:1548 (R;US)
CHARMED BARYON RESONANCES
See CHARMED BARYONS
CHARMED BARYONS
The E781 trigger and data acquisition system, 20:1623 (R;US)
CHARMONIUM
See also J PSI-3097 MESONS
Charmonium production, b quark and B meson production and $b\bar{b}$ correlations at CDF, 20:2152 (R;US)
Inelastic leptoproduction of J/ψ, 20:2162 (R;FR)
Polarization of charmonium in πN collisions, 20:2182 (R;US)
CHARPAK CHAMBERS
See MULTIWIRE PROPORTIONAL CHAMBERS
CHARS
Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994, 20:69 (R;US)
CHELATES
Production of superconducting thick films through cation chelated organic precursors, 20:1186 (IA;AU)
CHEMICAL EFFLUENTS
1993 Effluent and environmental monitoring report for the Bettis Atomic Power Laboratory, Pittsburgh Site, 20:468 (R;US)
Characterization and monitoring of 300 Area Facility liquid waste streams: Status report, 20:305 (R;US)
Research of documents pertaining to waste migration from leaking single-shell tanks, 20:472 (R;US)
CHEMICAL EXPLOSIONS
Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)

CHEMICAL EXPLOSIVES
Base hydrolysis and hydrothermal processing of PBX-9404, 20:291 (R;US)
Characterization of high-explosive initiation and safety at Los Alamos, 20:1687 (R;US)
Non destructive characterization using pulsed fast-thermal neutrons, 20:1293 (R;US)
The permeation of bis(2-fluoro-2,2-dinitroethyl) formal (FEFO), ethyl 4,4-dinitropentanoate (EDNP), ethyl 4-nitropentanoate (ENP), and 1,2,4-trichlorobenzene (TCB) through barrier membranes, 20:1688 (R;US)
Thermal decomposition reactions of HMX and RDX and their importance in predicting cookoff hazards, 20:1689 (R;US)

CHEMICAL HEAT PIPES
See HEAT PIPES

CHEMICAL REACTION KINETICS
See also COMBUSTION KINETICS
CHEMKIN2: General Gas-Phase Chemical Kinetics, 20:2538 (CM;US)

CHEMICAL REACTORS
See also RETORTS
The economical production of alcohol fuels from coal-derived synthesis gas: Eleventh quarterly technical progress report, April 1, 1994–June 30, 1994, 20:33 (R;US)

CHEMICAL WARFARE AGENTS
In situ analysis of soil at an open burning/open detonation disposal facility: J-Field, Aberdeen Proving Ground, Maryland, 20:1773 (R;US)
Validation of an in vitro test method to evaluate materials against liquid HD, 20:1700 (R;US)

CHEMICAL WASTES
See also CHEMICAL EFFLUENTS
1993 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site, 20:247 (R;US)
F-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:440 (R;US)
Method for treating materials for solidification, 20:296 (PA;US)

CHEMICO PROCESS
See DESULFURIZATION

CHEMISORPTION
Ab initio Hartree-Fock study of the B/Si(001) 2 x 1 adsorption system, 20:1349 (IA;AU)

CHEMSWEET PROCESS
See DESULFURIZATION

CHERNOFF FACES
See DATA PROCESSING

CHEVRON COAL LIQUEFACTION PROCESS
See COAL LIQUEFACTION

CHILE
Development of methods for evaluating options for improving the air quality in Santiago, Chile and its environs, 20:1766 (R;US)
Modelling the day to day wind variability offshore central Chile at about 30 deg. south, 20:718 (R;XA)

CHINA
Development of radiation utilization for economic growth in China, 20:2511 (IA;JP)
Programme and experience on training and qualification for nuclear power plant personnel in China, 20:2469 (RA;XA)

CHINESE HAMSTER
See HAMSTERS

CHINONE
See BENZOQUINONES

CHIRAL SYMMETRY
Dynamical chiral symmetry breaking in scale invariant quantum electrodynamics in sixth dimensions, 20:2094 (R;UA;In Russian)

CHLAMYDOMONAS
Nitrogen control of chloroplast differentiation, 20:1894 (R;US)

CHLORINATED ALIPHATIC HYDROCARBONS
See also CARBON TETRACHLORIDE
METHYL CHLORIDE
Avoidance of hazardous wastes in Hesse - CC residues: Phase II: Avoidance potential. Phase III: Practical application. Results, 20:1043 (I;DE;In German)
Fiber-optic sensors for rapid, inexpensive characterization of soil and ground water contamination, 20:1839 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report – Fourth quarter 1993 and 1993 summary: Volume 2, 20:474 (R;US)
Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)

CHLOROPHYLL
Nitrogen control of chloroplast differentiation, 20:1894 (R;US)

CHROMIUM
Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)

CHROMIUM ALLOYS
See also CHROMIUM-NICKEL STEELS
Computational modeling of diffusion-controlled transformations in ternary systems, 20:1106 (R;US)
Properties of V-4Cr-4Ti for application as fusion reactor structural components, 20:1100 (R;US)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)

CHROMIUM COMPLEXES
Dynamic NMR studies of restricted arene rotation in the chromiu tricarbonyl thiophene and selenophene complexes, 20:1363 (R;US)

CHROMIUM NITRIDES
Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)

CHROMIUM-NICKEL STEELS
Corrosion investigations on austenite chromium/nickel steels by electrochemical methods and photoelectron spectrometry, 20:1116 (I;DE;In German)

CHROMODYNAMICS
See QUANTUM CHROMODYNAMICS

CHROMOSOME BREAKAGE
G-banding analysis of radiation-induced chromosome damage in lymphocytes of Hiroshima atomic-bomb survivors, 20:1943 (R;JP)

CIRCULAR POINT COLLECTORS
See PARABOLIC DISH COLLECTORS

CITIES
See URBAN AREAS

CITREX PROCESS
See DESULFURIZATION

CLEANAIR PROCESS
See DESULFURIZATION

CLERICAL PERSONNEL
See PERSONNEL

CLIMATE MODELS
Low-frequency anomalies in the NMC MRF model and reality, 20:1718 (RA;US)
Synoptic scale eddies in the Northern Hemisphere summer: A POP analysis, 20:1719 (RA;US)
The importance of resolution on the response of mid-latitude transients to enhanced CO_2, 20:1733 (RA;US)

CLIMATES
Causes of decadal climate variability over the North Pacific and North America, 20:1752 (R;DE)
Interactions of the tropical oceans, 20:1754 (R;DE)

CLIMATIC CHANGE
See also GREENHOUSE EFFECT
Climatological features of blocking anticyclones, 20:1726 (RA;US)

Detecting anthropogenic climate change with an optimal fingerprint method, 20:1755 (R;DE)
The role of eddy transports in climate change, 20:1712 (RA;US)
Transient and stationary eddies in differing GCM climates, 20:1721 (RA;US)
Will greenhouse gas-induced warming over the next 50 years lead to higher frequency and greater intensity of hurricanes?, 20:1753 (R;DE)

CLINOPTILOLITE
Analysis of experimentally shocked minerals by NMR spectroscopy, 20:1285 (R;US)
Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)

CLINTON P. ANDERSON MESON PHYSICS FACILITY
See LAMPF LINAC

CLOUDS
An integrated cloud observation and modeling investigation in support of the ARM Program: Annual technical progress report, November 1, 1993–October 31, 1994, 20:1708 (R;US)

CLUSTER BEAMS
Non-linear sputtering effects induced by MeV energy gold clusters, 20:2359 (R;FR)

CLUSTER EMISSION MODEL
The properties of nucleon clusters production in (p, d) + Ta and (p, d) + C interactions over energy range from 4.2 to 10 GeV/c per nucleon, 20:2263 (R;XJ;In Russian)

CLUSTER MODEL
Shell structure in faceted metal clusters, 20:2363 (R;FR)
The Realization of the Resonating Group Method Algebraic Version for Three-Cluster Systems., 20:2217 (R;UA)

CLUSTERS (SOLID)
See SOLID CLUSTERS

CNEN BRAZIL
See BRAZILIAN CNEN

CO-GENERATION
See COGENERATION

COAL
See also BROWN COAL
COAL FINES
SUBBITUMINOUS COAL

Ash Content
Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content, 20:58 (IA;PL)

Bioconversion
Bench-scale demonstration of biological production of ethanol from coal synthesis gas: Quarterly report, April 1, 1994–June 30, 1994, 20:36 (R;US)
Large scale solubilization of coal and bioconversion to utilizable energy: Technical progress report, July 1, 1994–September 30, 1994, fourth quarterly, 20:41 (R;US)

China
Coal pricing in a centrally controlled, planned economy - the example of the People's Republic of China, 20:982 (I;DE;In German)

Combustion
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994, 20:738 (R;US)
High-pressure coal-fired ceramic air heater for gas turbine applications: Technical progress report for month of January 1994, 20:83 (R;US)
Particulate behavior in a controlled-profile pulverized coal-fired reactor: A study of coupled turbulent particle dispersion and thermal radiation transport: Quarterly technical progress report, December 15, 1993–March 14, 1994, 20:89 (R;US)

Combustion Kinetics
Mathematical models and parameter study of a burning coal particle, 20:92 (R;DK)

Combustion Products
Management of high sulfur coal combustion residues, issues and practices: Proceedings, 20:79 (R;US)

Desulfurization
Development of enhanced sulfur rejection processes: Final technical progress report: Seventh quarter, April 1, 1994–June 30, 1994, 20:5 (R;US)
Large scale solubilization of coal and bioconversion to utilizable energy: Technical progress report, July 1, 1994–September 30, 1994, fourth quarterly, 20:41 (R;US)

Drying
An investigation of the role of water on retrograde/condensation reactions and enhanced liquefaction yields: Quarterly progress report, July 1, 1994–September 30, 1994, 20:3 (R;US)
The use of solid-state NMR techniques for the analyses of water in coal and the effect of different coal drying techniques on the structure and reactivity of coal: Quarterly report, June 1, 1994–August 31, 1994, 20:35 (R;US)

Energy Conversion
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)

Flotation
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fifteenth quarterly report, 14 February 1994–13 May 1994, 20:2 (R;US)
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fourteenth quarterly report, 14 November 1993–13 February 1994, 20:1 (R;US)

Fluidized-Bed Combustion
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)
Volatiles combustion in fluidized beds: Technical progress report, 4 June 1994–3 September 1994, 20:1423 (R;US)

Fuel Slurries
Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions, 20:53 (R;DE;In German)

Gasification
Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994, 20:69 (R;US)

Image Processing
Characterization of coal particles using rule base on-line image analysis: [Quarterly] technical report, December 1, 1993–February 28, 1994, 20:56 (R;US)

Iron Compounds
Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content, 20:58 (IA;PL)

Materials Handling
Quarterly progress report, April 1, 1994–June 30, 1994, 20:1671 (R;US)

Mathematical Models
Mathematical models and parameter study of a burning coal particle, 20:92 (R;DK)

Meetings
Management of high sulfur coal combustion residues, issues and practices: Proceedings, 20:79 (R;US)

Minerals
Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content, 20:58 (IA;PL)

Molecular Structure
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)

Nmr Spectra
The use of solid-state NMR techniques for the analyses of water in coal and the effect of different coal drying techniques on the structure and reactivity of coal: Quarterly report, June 1, 1994–August 31, 1994, 20:35 (R;US)

Nondestructive Analysis
Non destructive characterization using pulsed fast-thermal neutrons, 20:1293 (R;US)

Physical Properties
An investigation of the role of water on retrograde/condensation reactions and enhanced liquefaction yields: Quarterly progress report, July 1, 1994–September 30, 1994, 20:3 (R;US)

Prices
Coal pricing in a centrally controlled, planned economy - the example of the People's Republic of China, 20:982 (I;DE;In German)

Pyrolysis
Nitration of polynuclear aromatic hydrocarbons in coal combustors and exhaust streams: Quarterly report, April 1, 1994–June 30, 1994, 20:55 (R;US)

Sampling
Solid waste sampling and distribution project: Sampling report #4, 20:62 (R;US)

Thermochemical Processes
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)

Thermodynamic Properties
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)

Water
Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions, 20:53 (R;DE;In German)

COAL FINES
Bench scale testing of micronized magnetite beneficiation: Quarterly technical progress report, January–March 1994, 20:4 (R;US)
Novel microorganism for selective separation of coal from ash and pyrite: Third quarterly technical progress report, March 1, 1994–May 31, 1994, 20:40 (R;US)

COAL FUEL CELLS
Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly technical status report, April–June, 1992, 20:1007 (R;US)

COAL GAS
Chloride and mercury monitors for air toxics measurements, 20:71 (R;US)
Hot coal gas desulfurization with manganese-based sorbents: Quarterly report, January–March 1994, 20:15 (R;US)
Trace species emissions for IGFC, 20:64 (R;US)

COAL GASIFICATION
Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)
Scale-up of mild gasification to a process development unit, 20:8 (R;US)
Scale-up of mild gasification to a process development unit: Quarterly report, February–May, 1994, 20:11 (R;US)
Trace element emissions, 20:63 (R;US)
Trace species emissions for IGFC, 20:64 (R;US)
Upgrading mild gasification liquids to produce electrode binder pitch: [Quarterly] technical report, December 1, 1993–February 28, 1994, 20:38 (R;US)

COAL GASIFICATION PLANTS
Fiscal 1993 investigational research on the development of a peat utilization mild gas production system, 20:47 (I;JP;In Japanese)
Fossil fuel conversion–measurement and modeling, 20:729 (R;US)
Gasification Product Improvement Facility status, 20:14 (R;US)
Toms Creek Integrated Gasification Combined-Cycle Demonstration Project: Quarterly report, April–June, 1994, 20:728 (R;US)

COAL INDUSTRY
Coal pricing in a centrally controlled, planned economy - the example of the People's Republic of China, 20:982 (I;DE;In German)
Lectures on the Pacific rim region Coal Workshop 1993, 20:93 (I;JP;In Japanese)

COAL LIQUEFACTION
See also BCL PROCESS
TSL PROCESS

Bitumens
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)

Catalysts
Catalysts and process developments for two-stage liquefaction, Report No. 24: Quarterly technical progress report - Second quarter FY 1990, January 1, 1990–March 31, 1990, 20:25 (R;US)
Catalysts and process developments for two-stage liquefaction. Report No. 8: Quarterly technical progress report, second quarter FY 1989, January 1, 1989–March 31, 1989, 20:22 (R;US)
Catalysts and process developments for two-stage liquefaction. Report no. 16: Quarterly technical progress report, fourth quarter FY 1989, July 1, 1989–September 30, 1989, 20:23 (R;US)
Catalysts and process developments for two-stage liquefaction: First quarterly technical progress report No. 52, October 1, 1991–December 31, 1991, 20:19 (R;US)
Catalysts and process developments for two-stage liquefaction: Report No. 12, quarterly technical progress report, April 1, 1989–June 30, 1989, third quarter FY 1989, 20:21 (R;US)
Catalysts and process developments for two-stage liquefaction: Report No. 20, quarterly technical progress report, October 1, 1989–December 31, 1989, first quarter FY 1990, 20:24 (R;US)
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
Evaluation of fine-particle catalysts: Activity testing results and phase identification using Mossbauer spectroscopy, 20:52 (R;US)

Cost
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)

Diesel Fuels
Preliminary investigation on Japan's cooperation with Mongolia for coal liquefaction technology, 20:46 (I;JP;In Japanese)

Efficiency
An investigation of the role of water on retrograde/condensation reactions and enhanced liquefaction yields: Quarterly progress report, July 1, 1994–September 30, 1994, 20:3 (R;US)

Gasoline
Preliminary investigation on Japan's cooperation with Mongolia for coal liquefaction technology, 20:46 (I;JP;In Japanese)

Optimization
Advanced coal liquefaction to Pittsburgh Energy Technology Center: Quarterly report, April 1, 1994–June 30, 1994, 20:37 (R;US)
Bench-scale demonstration of biological production of ethanol from coal synthesis gas: Quarterly report, April 1, 1994–June 30, 1994, 20:36 (R;US)
Short contact time direct coal liquefaction using a novel batch reactor: Progress report, May 16, 1994–September 15, 1994, 20:39 (R;US)
The use of solid-state NMR techniques for the analyses of water in coal and the effect of different coal drying techniques on the structure and reactivity of coal: Quarterly report, June 1, 1994–August 31, 1994, 20:35 (R;US)

Petroleum
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)

Prices
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)

Raw Materials
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)

Residues
Deashing of coal liquids by sonically assisted filtration, 20:48 (R;US)

Shale Tar
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)

COAL LIQUEFACTION PLANTS
Short contact time direct coal liquefaction using a novel batch reactor: Progress report, May 16, 1994–September 15, 1994, 20:39 (R;US)

COAL LIQUIDS
Advanced coal liquefaction to Pittsburgh Energy Technology Center: Quarterly report, April 1, 1994–June 30, 1994, 20:37 (R;US)
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Deashing of coal liquids by sonically assisted filtration, 20:48 (R;US)
Hindered diffusion of coal liquids: Quarterly report No. 7, March 18, 1994–June 17, 1994, 20:57 (R;US)
Separation of solids from coal liquefaction products using sonic waves, 20:49 (R;US)
COAL PLANERS
See COAL PLOWS
COAL PLOUGHS
See COAL PLOWS
COAL PLOWS
Development of an optics-based method for reducing mine-stone content of run-of-mine coal: Final report, 20:72 (I;DE;In German)
COAL PREPARATION
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Development of enhanced sulfur rejection processes: Final technical progress report: Seventh quarter, April 1, 1994–June 30, 1994, 20:5 (R;US)
COAL RESERVES
Preliminary investigation on Japan's cooperation with Mongolia for coal liquefaction technology, 20:46 (I;JP;In Japanese)
COAL TAR
Nitration of polynuclear aromatic hydrocarbons in coal combustors and exhaust streams: Quarterly report, April 1, 1994–June 30, 1994, 20:55 (R;US)
COAL-DERIVED GASES
See COAL GAS
COAL-DERIVED LIQUIDS
See COAL LIQUIDS
COAL-FIRED GAS TURBINES
Advanced coal-fueled industrial cogeneration gas turbine system – combustion development, 20:81 (R;US)
Advanced coal-fueled industrial cogeneration gas turbine system particle removal system development, 20:82 (R;US)
COAL-OIL MIXTURES
See COAL
FUEL OILS
FUEL SLURRIES
COALBED METHANE
See METHANE
COASTAL REGIONS
Ocean Margins Program: Closure on the global carbon cycle: Program description, 20:1845 (R;US)
On the generation of coastal lows in central Chile, 20:1748 (R;XA)
COATING (SURFACE)
See SURFACE COATING
COATING PROCESSES
See SURFACE COATING
COBALT
Model studies of hydrodesulfurization by Mo: The effect of promoters: Progress report, December 1, 1993–November 30, 1994, 20:1294 (R;US)
COBALT 66
Separation and implantation of relativistic ^{86}Kr-fragments at the FRS: Half-life measurement by ion-β time-correlations, 20:2246 (R;FR)
COGENERATION
Project considerations and design of systems for wheeling cogenerated power, 20:1040 (R;US)
Small-scale biomass fueled cogeneration systems - A guidebook for general audiences, 20:1055 (R;US)
COHERENT ANTI-STOKES RAMAN SPECTROSCOPY
See RAMAN SPECTROSCOPY
COIL PROCESS
See COAL LIQUEFACTION
COILS (MAGNETIC)
See MAGNET COILS
COKE-OVEN GAS
See COAL GAS
COLIFORMS
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)
COLLECTRONS
See SELF-POWERED NEUTRON DETECTORS
COLLEGES
See EDUCATIONAL FACILITIES
COLLIDER DETECTOR AT FERMILAB
See FERMILAB COLLIDER DETECTOR
COLLOIDS
See also GELS
Removal of organic scales and processing of tertiary oil. Pt. 1: Removal of organic scales in watered-down wet oil probes, 20:121 (R;DE;In German)
Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures, 20:288 (R;US)
COLOGNE SPIRITS
See ETHANOL
COLORIMETRY
See ABSORPTION SPECTROSCOPY
COLUMBIA RIVER
300 Area treated effluent disposal facility operating specifications document, 20:1860 (R;US)
Diel and seasonal white sturgeon (Acipenser transmontanus) movements in relation to Columbia River temperatures, 20:838 (R;US)
Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Factors affecting the quality of fish caught by Native Americans in the Zone 6 fishery 1991 through 1993, 20:1858 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)
KE Basin water dispositioning engineering study, 20:470 (R;US)
Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers, 20:639 (R;US)
COLUMNS (MECHANICAL)
See MECHANICAL STRUCTURES
COMBINED GAS AND STEAM CYCLE POWER PLANTS
See COMBINED-CYCLE POWER PLANTS
COMBINED SOXNOX PROCESSES
Solid waste sampling and distribution project: Sampling report #4, 20:62 (R;US)
COMBINED STEAM-POWER GENERATION
See COGENERATION
COMBINED-CYCLE POWER PLANTS
Combined cycle (CC) power station in the 250-MW power range with integrated coal gasification according to MBG technology: Final report, 20:731 (I;DE;In German)
Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)
Gasification Product Improvement Facility status, 20:14 (R;US)
The technoeconomic evaluation of solar steam supply to fossil fired combined power cycle (SOLCOM I 1994.), 20:674 (IA;IL)
Toms Creek Integrated Gasification Combined-Cycle Demonstration Project: Quarterly report, April–June, 1994, 20:728 (R;US)
COMBUSTION
See also FLUIDIZED-BED COMBUSTION
Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material, 20:1425 (R;US)
On the thermal characteristics of diesel particulate filter, 20:1070 (IA;JP;In Japanese)
Role of char during reburning of nitrogen oxides: Second quarterly report, January 1, 1994–March 31, 1994, 20:69 (R;US)
Temperature bounds in a model of laminar flames, 20:2010 (R;XA)

COPPER
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Benchmark experiment on a copper slab assembly bombarded by D-T neutrons, 20:2439 (R;JP)
Characterization and electrical properties of copper films grown via direct liquid coinjection of (hfac)Cu(TMVS) and TMVS, 20:1163 (R;US)
Copper metallization of stainless steels: Final report, 20:1149 (R;US)
Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994, 20:128 (R;US)
Development of methods for evaluating options for improving the air quality in Santiago, Chile and its environs, 20:1766 (R;US)
On the Taylor test, Part 3: A continuum mechanics code analysis of steady plastic wave propagation, 20:1154 (R;US)
Particularities of copper structure state after low-temperature recrystallization, 20:1141 (IA;UA;In Russian)
Photoemission study of the Fermi surface of Cu, 20:2392 (IA;AU)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)

COPPER ALLOYS
See also COPPER BASE ALLOYS
A study of the Cu_3 Au(110) surface using low energy ion scattering, 20:1126 (IA;AU)

COPPER BASE ALLOYS
An investigation of preferential sputtering from single-phase α- and β- Cu/Zn alloys, 20:1122 (IA;AU)

COPPER COMPOUNDS
See also COPPER OXIDES
CUPRATES
Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)

COPPER OXIDES
Crystal Structure
Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
D States
Polarization and intensity of d d-transitions in superconducting copper oxides, 20:1235 (R;UA)
Electric Conductivity
Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites., 20:1228 (IA;UA;In Russian)
Fabrication
Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)
Heat Treatments
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
Magnetic Fields
Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Magnetic Properties
Neutron diffraction study of the magnetic ordering of $BaCuO_{2+x}$, 20:1174 (R;US)
Microscopy
High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)
Microstructure
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Phase Studies
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Sample Preparation
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Shear Properties
Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Superconducting Junctions
Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites., 20:1228 (IA;UA;In Russian)
Superconductivity
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)
Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal, 20:2384 (R;US)
Thermodynamic Properties
High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)
Ultrasonic Testing
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)

COPPER SELENIDE SOLAR CELLS
Polycrystalline $CuInSe_2$ and CdTe PV solar cells: Annual subcontract report, 15 April 1993–14 April 1994, 20:690 (R;US)

CORES (REACTOR)
See REACTOR CORES

CORIUM
Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)

CORN STOVER
See AGRICULTURAL WASTES

CORONARIES
Today and tomorrow of intravenous coronary angiography programme in Japan, 20:1878 (IA;JP)
Transvenous coronary angiography in humans with synchrotron radiation, 20:1872 (R;US)

CORRELATION ENERGY
See ELECTRON CORRELATION

CORTEX (ADRENAL)
See ADRENAL GLANDS

COSMIC GASES
Far-infrared and submillimeter spectroscopy of photodissociation regions, 20:2282 (R;XA)

COSMOLOGICAL MODELS
Homogeneous anisotropic cosmological models in the minimum quadratic Poincare gauge theory of gravity, 20:2046 (R;XA)

COSMOS
See UNIVERSE

COST
Fiscal 1993 investigational research on the development of a peat utilization mild gas production system, 20:47 (I;JP;In Japanese)

COST ESTIMATION
AES6.0F: Automated Estimating System, 20:2537 (CM;US)
Estimating household fuel oil/kerosine, natural gas, and LPG prices by census region, 20:997 (R;US)

COSY STORAGE RING
Development of an induction drift chamber for experiments at COSY and high-rate effects according to a new method, 20:1645 (R;DE;In German)
Strangeness production in the pp and pp scattering, 20:1646 (R;DE;In German)

COUNTERS (RADIATION)
See RADIATION DETECTORS

COUNTING TECHNIQUES
Deep inelastic e-γscattering, with beamsstrahlung, 20:1619 (RA;DE)
Strangeness production in the pp and pp scattering, 20:1646 (R;DE;In German)

The qualitative and fuzzy contributions for industrial process diagnostic. Application in the DIAPASON project, 20:163 (R;FR;In French)
Tonopah Test Range EGS graphics tracking display system: HP370, 20:1697 (R;US)

COMPUTERIZED SIMULATION
Enhancement of peak searching capability in nuclear spectrometry, 20:2540 (IA;TH;In Thai)
Monte Carlo simulations with indefinite and complex-valued measures, 20:2027 (R;AU)

COMPUTERS
See also DEC COMPUTERS
MICROPROCESSORS
OPTICAL COMPUTERS
Lawrence Livermore National Laboratory safeguards and security quarterly progress report to the U.S. Department of Energy: Quarter ending June 30, 1994, 20:562 (R;US)
Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures, 20:1948 (R;US)
Top ten list of user-hostile interface design, 20:2558 (R;US)

CONCENTRATIONS (RADIONUCLIDES)
See RADIOACTIVITY

CONCENTRATOR SOLAR CELLS
Development of concentrator solar cells, 20:691 (R;US)
Si concentrator solar cell development: [Final report], 20:692 (R;US)

CONCRETES
The micro pore structure of concrete determined by small angle neutron scattering, 20:2335 (IA;AU)

CONDENSERS (ELECTRIC)
See CAPACITORS

CONDIMENTS
See FOOD

CONDUCTORS (ELECTRIC)
See ELECTRIC CONDUCTORS

CONFERENCES
See MEETINGS

CONIFERS
See also PINES
Forest decline in the Southern Appalachian Mountains. Research and observations: 1983-1989, 20:1817 (IA;DE)

CONING
See CHANNELING

CONOCO GASIFICATION PROCESS
See COAL GASIFICATION

CONOCO PROCESS
See DESULFURIZATION

CONSERVATION (ENERGY)
See ENERGY CONSERVATION

CONSOL SYNTHETIC FUEL PROCESS
See COAL LIQUEFACTION

CONSTRUCTION
AES6.0F: Automated Estimating System, 20:2537 (CM;US)

CONSTRUCTION INDUSTRY
Building Technologies Program, 1993 annual report, 20:1025 (R;US)
Energy Analysis Program, 1993 annual report, 20:1023 (R;US)

CONSUMERS POWER COMPANY MIDLAND-1
See MIDLAND-1 REACTOR

CONTACT RADIOTHERAPY
See RADIOTHERAPY

CONTACTS (ELECTRIC)
See ELECTRIC CONTACTS

CONTAINERS
See also CAPSULES
CASKS
PRESSURE VESSELS
TANKS
Aerosol can puncture device operational test plan, 20:356 (R;US)
Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
Drum investigation committee final report, 20:212 (R;US)
Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data, 20:256 (R;US)
One-trip drum operating instruction, 20:352 (R;US)
Piercing tool, Transportation Accident Resistant Container (TARC), 20:1449 (R;US)
Predicting the pressure driven flow of gases through micro-capillaries and micro-orifices, 20:1442 (R;US)
Report of trip to Los Alamos, Albuquerque Operations Office, and ACF Industries, September 17–19, 1956, 20:1434 (R;US)

CONTAINMENT BUILDINGS
The protection and inspection of prestressing tendons in containment structures of nuclear power plants, 20:752 (R;FI;In Finnish)

CONTAINMENT SHELLS
Buckling evaluation of System 80+™ containment, 20:879 (R;US)

CONTAINMENT SYSTEMS
Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)
Feasibility study of tank leakage mitigation using subsurface barriers, 20:529 (R;US)
Radiological containment selection, design, and specification guide, 20:381 (R;US)
Summary of operating experience in Swiss nuclear power plants 1993, 20:800 (I;CH)

CONTAMINATION
See also SURFACE CONTAMINATION
ELIPGRID-PC: A PC program for calculating hot spot probabilities, 20:1827 (R;US)
The management of site contamination, 20:1701 (IA;PL)

CONTAMINATION (SURFACE)
See SURFACE CONTAMINATION

CONTAMINATION REGULATIONS
Savannah River Site Environmental Monitoring Plan: Volume 1, Section 1000 Addendum: Revision 3, 20:473 (R;US)

CONTROL (RADIOACTIVITY)
See RADIATION MONITORING

CONTROL ELEMENTS
Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants, 20:755 (R;FR;In French)

CONTROL EQUIPMENT
Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)

CONTROL RODS
See CONTROL ELEMENTS

CONTROL ROOMS
100-N technical manual: Volume 2A: Systems descriptions, 20:826 (R;US)

CONTROL SYSTEMS
See also REACTOR CONTROL SYSTEMS
Automated boiler combustion controls for emission reduction and efficiency improvement: Quarterly progress report, February 14, 1994–May 14, 1994, 20:91 (R;US)

CONTROL THEORY (REACTOR)
See REACTOR KINETICS

CONVECTION
See also NATURAL CONVECTION
Thermal convection with phase change: Experimental investigations and comparison with numerical results, 20:1471 (I;DE;In German)

CONVERTOL PROCESS
See COAL PREPARATION

CONVEYORS
Work plan for 105KE Basin seal conveyor relocation, 20:350 (R;US)

COOLERS
See HEAT EXCHANGERS

COOLING SYSTEM (REACTOR)
See REACTOR COOLING SYSTEMS

COOLING SYSTEMS
See also REACTOR COOLING SYSTEMS
Summary of evaporative cooling system for the SSC silicon tracker, 20:1649 (R;US)

Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)

COMBUSTION KINETICS
Studies in nonlinear problems of energy: Progress report, October 1, 1993–September 30, 1994, 20:1422 (R;US)

COMBUSTION PRODUCTS
See also ASHES
Determination of ash content in lignite using X-ray backscattering technique, 20:1310 (IA;TH;In Thai)
Determination of ash content in lignite using gamma-ray transmission technique, 20:1309 (IA;TH;In Thai)
Low-cost nuclear technique for lignite ash determination, 20:1305 (IA;TH;In Thai)

COMBUSTORS
See also FLUIDIZED-BED COMBUSTORS
Development and testing of a high efficiency advanced coal combustor: Phase III Industrial boiler retrofit: Quarterly technical progress report number 10, January 1–March 31, 1994, 20:88 (R;US)
High-pressure coal-fired ceramic air heater for gas turbine applications: Technical progress report for month of January 1994, 20:83 (R;US)

COMETS
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)

COMMERCIAL BUILDINGS
Building Technologies Program, 1993 annual report, 20:1025 (R;US)
Energy Analysis Program, 1993 annual report, 20:1023 (R;US)
Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0, 20:1020 (R;US)
Whole-building energy targets "A" prototype, initial version, 20:1031 (R;US)

COMMERCIAL SECTOR
Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal, 20:236 (R;US)
Project considerations and design of systems for wheeling cogenerated power, 20:1040 (R;US)

COMMERCIALIZATION
Research on the promotion measures to introduce new energy and energy-saving technologies with a leasing system, 20:929 (R;JP;In Japanese)

COMMUNITIES (ECOLOGICAL)
See ECOSYSTEMS

COMPACTING
A shock-Hugoniot for $Sm_2 Fe_{17} N_x$ powder, 20:1179 (IA;AU)

COMPACTORS
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)

COMPLEX TERRAIN
Stability effects on the profiles of vertical velocity and its variance in katabatic flow, 20:717 (R;US)

COMPOSITE MATERIALS
See also SUPERCONDUCTING COMPOSITES
Carbon fiber reinforced superconductor composites: Final report, August 8, 1991–August 7, 1994, 20:1241 (R;US)
Creep behavior in SiC whisker-reinforced alumina composite, 20:1240 (R;US)
Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)
Investigation of thermal conductivity in polymer-ceramic HTSC composites., 20:1279 (IA;UA;In Russian)
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Thermal processes at compacted composite Y $Ba_2 Cu_3 O_\delta$/Ag cooling by liquid nitrogen., 20:1231 (IA;UA;In Russian)
Topography of neutron scattering from diblock copolymer film, 20:1239 (R;US)
Toughened Silcomp composites for gas turbine engine applications: Continuous fiber ceramic composites program: Phase I final report, April 1992–June 1994, 20:1063 (R;US)
Wear resistant composite structure of vitreous carbon containing convoluted fibers: Quarterly report number 2, 20:1242 (R;US)

COMPOUND NUCLEI
Realistic microscopic level densities for spherical nuclei, 20:2216 (R;FR)

COMPOUNDS (ORGANIC)
See ORGANIC COMPOUNDS

COMPRESSION RATIO
Study of diesel cycle with a new condition of restricting a cycle and the best values, 20:1069 (IA;JP;In Japanese)

COMPUTER ARCHITECTURE
Ergonomic evaluation of the Apple Adjustable Keyboard, 20:2564 (R;US)
Quantitative evaluation of wrist posture and typing performance: A comparative study of 4 computer keyboards, 20:2563 (R;US)

COMPUTER CALCULATIONS
A Hypervelocity Experimental Research Database (HERD): Support for the Wright Laboratory Armament Directorate Code Validation Program (COVAL), 20:1698 (R;US)
Adventures in supercomputing, a K-12 program in computational science: An assessment, 20:1427 (R;US)
Functional & para-functional parallel processing, 20:2534 (R;US)
Research in functional programming on multiprocessor architectures: Final report, 20:2535 (R;US)

COMPUTER CODES
See also A CODES
C CODES
E CODES
L CODES
M CODES
Q CODES
R CODES
S CODES
V CODES
RESRAD benchmarking against six radiation exposure pathway models, 20:1906 (R;US)
Software quality assurance plan for viscometer, 20:407 (R;US)
Software quality assurance plan for void fraction instrument, 20:408 (R;US)

COMPUTER NETWORKS
An object-oriented implementation of the Xpress Transfer Protocol, 20:2559 (R;US)
Toxic Chemical System (TCS), 20:1368 (R;US)

COMPUTER PROGRAMMING
See PROGRAMMING

COMPUTER PROGRAMS
See COMPUTER CODES

COMPUTER-AIDED MANUFACTURING
Assembly partitioning with a constant number of translations, 20:1447 (R;US)
Representing manufacturing features to support design and process changes, 20:1046 (R;US)

COMPUTERIZED CONTROL SYSTEMS
Automatic generation of fuzzy rules for the sensor-based navigation of a mobile robot, 20:1038 (R;US)
Computer operated 256 channel pulse analyser for scintillation and proportional detectors, 20:1640 (IA;PL)
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
Control and data acquisition system of electron linear accelerator for radiation processing, 20:1553 (IA;PL)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Low-level RF LabVIEW® control software user's manual: Version 1.0, 20:1586 (R;US)
Multi-points mobile radiotracer laboratory, 20:604 (IA;PL)
Roll control resonance test vehicle (RCRTV) system postflight evaluation report, 20:1034 (R;US)
System design description for mini-dacs data acquisition and control system, 20:1460 (R;US)

CP INVARIANCE
CP violation in Higgs decays due to Majorana neutrinos, 20:2103 (RA;DE)
CP violation in top quark pair production, 20:2125 (RA;DE)
Correlations in Higgs production and decay as a probe of CP-violation in the scalar sector, 20:2104 (RA;DE)
Measurement of the angle gamma, 20:2031 (R;FR)

CRACK GROWTH
See CRACK PROPAGATION

CRACK PROPAGATION
The role of microcracking on the crack growth resistance of brittle solids and composites, 20:1280 (R;US)

CRANES
Stress analysis of core sampler truck number 2 platform: 2,000 LBF crane lift capacity, 20:1459 (R;US)

CREEKS
See STREAMS

CREEP
High temperature high vacuum creep testing facilities, 20:1479 (R;EG)
Numerical description of creep of highly creep resistant alloys, 20:1140 (I;DE;In German)

CRICETULUS
See HAMSTERS

CRITICAL FLOW
Droplet size and velocity at the exit of a nozzle with two-component near critical and critical flow, 20:1463 (R;FR)

CRITICAL HEAT FLUX
A better approach to the MDNBR concept, 20:1464 (R;FR)
The effect of grid assembly mixing vanes on critical heat flux values and azimuthal location in fuel assemblies, 20:760 (R;FR)

CRITICALITY
Comparison of different calculational methods for spent fuel storage criticality calculations, 20:204 (RA;XA)
Validation of Nuclear Criticality Safety Software and 27 energy group ENDF/B-IV cross sections, 20:1443 (R;US)

CRITICALITY ACCIDENTS
See CRITICALITY
RADIATION ACCIDENTS

CROPS
Nitrogen accumulation profiles of selected grain and vegetable crops: A bibliography (1940-1992), 20:1870 (R;US)

CRUDE OIL
See PETROLEUM

CRYSTAL DEFECTS
Channeling contrast microscopy of defects in type II-VI MSM photodetectors, 20:2328 (IA;AU)
The behaviour of oxygen related defects in BSCCO near the critical temperature, 20:1205 (IA;AU)
Time-dependent atomic displacements in solid state diffusion, 20:2315 (IA;AU)
Tracer correlation factor and atomic displacements in solid state diffusion, 20:2351 (IA;AU)

CRYSTAL GROWTH
Domain growth in weakly disordered magnets: A coupled map lattice approach, 20:2300 (R;XA)
Molecular dynamic study of compressive stress generation, 20:2354 (IA;AU)

CRYSTAL LATTICES
Classical lattice dynamics: Foreman-Lomer theory and the Blackman sum rule, 20:2019 (IA;AU)
Coherent state path-integral representation of supersymmetric lattice models, 20:2365 (R;XA)

CRYSTAL MODELS
See also HEISENBERG MODEL
ISING MODEL
Long-range two-hole bound states in the t-J model, 20:2369 (IA;AU)

CRYSTAL STRUCTURE
See also CRYSTAL DEFECTS
CRYSTAL LATTICES
Computer simulation of binary alloy structure in the Ising model scheme, 20:1139 (IA;PL)
Cross sectional imaging of single crystal materials by ion beam analysis, 20:2349 (IA;AU)
Diffuse neutron scattering studies of single crystal specimens of Fe_{3-x} Mn_x Si, 20:1123 (IA;AU)
Inelastic neutron scattering from cubic stabilised zirconia, 20:2334 (IA;AU)
Monte Carlo simulation of nanodomain textures in relaxor-type lead scandium tantalate, 20:2352 (IA;AU)
Two dimensional antiferromagnetic ordering in MnPS3, 20:1265 (IA;AU)

CRYSTALLINE ROCKS
See METAMORPHIC ROCKS

CRYSTALS
See also LIQUID CRYSTALS
Quantum group random walks in strongly correlated 2+1 D spin systems, 20:2390 (R;XA)

CSF PROCESS
See COAL LIQUEFACTION

CSIRO PROCESS
See COAL GASIFICATION

CULTURAL OBJECTS
Application of X-ray radiography to archaeology, 20:581 (IA;JP;In Japanese)

CUMULATIVE EFFECT
See PARTICLE PRODUCTION

CUPRATES
Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)

CURING
Cure monitoring with fibre optic sensors, 20:1258 (IA;AU)

CURIUM ISOTOPES
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

CURRENT DENSITY
Current distribution in Cable-In-Conduit Conductors, 20:2433 (R;US)
Effect of columnar defects on the critical current anisotropy of epitaxial YBa_2 Cu_3 $O_{7-\delta}$ thin films and YBa_2 Cu_3 $O_{7-\delta}$/$PrBa_2$ Cu_3 $O_{7-\delta}$ multilayers, 20:1207 (IA;AU)
The effect of silver on the I-V characteristics of BSCCO silver-sheathed tapes, 20:1206 (IA;AU)

CURRENTS (ALGEBRAIC)
See ALGEBRAIC CURRENTS

CYCASIN
See CARCINOGENS

CYCLONE SEPARATORS
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fifteenth quarterly report, 14 February 1994–13 May 1994, 20:2 (R;US)
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Sixteenth quarterly report, 14 May–13 August 1994, 20:1297 (R;US)

CYLINDRICAL PARABOLIC COLLECTORS
See PARABOLIC TROUGH COLLECTORS

CYTRIPHOS
See AMINES

CZD PROCESS
See DESULFURIZATION

CZECH REPUBLIC
Spent fuel management and disposal programme (SFMDP) strategy for the Czech Republic, 20:193 (RA;XA)
Spent nuclear fuel in the Czech Republic, 20:272 (RA;XA)
The Czech Republic Nuclear Power Programme present situation and its development, 20:2470 (RA;XA)
The Czech Republic programme and experiences on training and qualification for NPPs personnel, 20:2499 (RA;XA)

CZECHOSLOVAKIA
See CZECH REPUBLIC
SLOVAKIA

D

D MESONS
Annihilation diagrams in two-body nonleptonic decays of charmed mesons, 20:2157 (R;XA)
$D^{*\pm}$ production in two-photon process, 20:2171 (RA;JP)
Measurement of the $D^{*\pm}$ cross section using a soft-pion analysis in two-photon processes, 20:2172 (RA;JP)

D PLUS RESONANCES
See D MESONS

D*-2010 MESONS
Measurement of the decay fractions of D* mesons, 20:2144 (R;DE)

D-1865 RESONANCES
See D MESONS

D-2007 RESONANCES
See D*-2010 MESONS

DAMPING
Piezoelectric ceramic/polymer composites for dumping of mechanical vibrations, 20:1197 (IA;AU)

DAMS
Lower Yakima Valley Wetlands and Riparian Restoration Project: Final environmental assessment, 20:638 (R;US)

DANNY BOY EVENT
See NUCLEAR EXPLOSIONS

DARMSTADT STORAGE RING
See ESR STORAGE RING

DATA ACQUISITION
Present status of petroleum substitution energy (USA), 20:1089 (R;JP;In Japanese)

DATA ACQUISITION SYSTEMS
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Data acquisition for the CDF SVX II upgrade, 20:1622 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)
Guidelines for multipurpose data systems for nuclear power plants, 20:743 (R;XA)
Method and apparatus for high speed data acquisition and processing, 20:2555 (PA;US)
System design description for mini-dacs data acquisition and control system, 20:1460 (R;US)
Tank Monitor and Control System sensor acceptance test procedure: Revision 5, 20:372 (R;US)
Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)

DATA BASE MANAGEMENT
Decontamination & Decommissioning Equipment Tracking System (DDETS), 20:1915 (R;US)
MBA acceptance test procedures, software Version 1.4, 20:566 (R;US)

DATA PROCESSING
Design and implementation of an integrated architecture for massive parallel data treatment of analogue signals supplied by silicon detectors of very high spatial resolution, 20:2539 (R;FR;In French)
SWEPP gamma-ray spectrometer system software user's guide, 20:258 (R;US)

DATA STORAGE DEVICES
See MEMORY DEVICES

DATA TRANSMISSION SYSTEMS
High speed optical links between LLNL and Berkeley, 20:2565 (R;US)

DAVY S-H PROCESS
See DESULFURIZATION

DAYLIGHTING
The design and evaluation of three advanced daylighting systems: Light shelves, light pipes and skylights, 20:1021 (R;US)

DE BROGLIE WAVELENGTH
Observation of the scalar Aharonov-Bohm effect by neutron interferometry, 20:2004 (R;AU)

DEBRIS (NUCLEAR)
See FISSION PRODUCTS

DEC COMPUTERS
A software package to process an INIS magnetic tape on the VAX computer, 20:2531 (R;EG)

DECAY HEAT REMOVAL
See AFTER-HEAT REMOVAL

DECHANNELING
See CHANNELING

DECIDUOUS TREES
Morphological changes in the crowns of European beech (Fagus sylvatica L.) and other deciduous tree species, 20:1956 (IA;DE)

DECOMMISSIONING
See also REACTOR DECOMMISSIONING
Decontamination & Decommissioning Equipment Tracking System (DDETS), 20:1915 (R;US)

DECONTAMINATION
Decontamination & Decommissioning Equipment Tracking System (DDETS), 20:1915 (R;US)
Results of the radiological and beryllium verification survey at the Peek Street Site, Schenectady, New York (SY001V), 20:505 (R;US)

DECONTAMINATION FACTOR
See DECONTAMINATION

DEFICIENCY (NUTRITIONAL)
See NUTRITIONAL DEFICIENCY

DEFORMED NUCLEI
E1 and E3 transition rates in the sdf-IBA, 20:2206 (R;US)
Evidence for pervasive phonon structure of nuclear excitations, 20:2204 (R;US)
Superdeformed rotational bands in the Mercury region: A cranked Skyrme-Hartree-Fock-Bogoliubov study, 20:2215 (R;FR)

DEGRADATION (RADIOINDUCED)
See RADIOLYSIS

DELTA BARYONS
Δ decay and absorption in nuclei, 20:2161 (R;FR)
Exclusive measurements of Δ excitation by the (^{3}He,t) reaction, 20:2249 (R;FR)

DELTA-1960 RESONANCES
See DELTA BARYONS

DELTA-2850 RESONANCES
See DELTA BARYONS

DENMARK
Air quality in the metropolitan area 1992-93, 20:1768 (R;DK;In Danish)
Energy and the environment: Investigation carried out by the Energy Conservation Committee on the attitudes and behaviour of the public in relation to environmental protection and energy conservation, 20:979 (R;DK;In Danish)
Low energy program 1990-2000 within the Energy Ministry Research Programs: Working report August 1991, 20:1028 (R;DK;In Danish)

DENSITY (ELECTRON)
See ELECTRON DENSITY

DENSITY (POPULATION)
See POPULATION DENSITY

DEOXIDATION
See REDUCTION

DEOXYCYTIDINURIA
See URINE

DEOXYPENTOSE NUCLEIC ACID
See DNA

DEOXYRIBONUCLEIC ACID
See DNA

DEPLETION (ISOTOPIC)
See ISOTOPE SEPARATION

DEPOSITION
See also SURFACE COATING
Verification and validation of DEPOSITION 2.0, 20:1657 (R;US)

DESALINATION
Potential uses of solar energy for water desalination (SOLCOM I 1994.), 20:653 (IA;IL)

DESALINATION PLANTS
Field test of a wind-powered vapour compression plant for seawater desalination in stand-alone operation: Final report, 20:719 (I;DE;In German)
DESERTRON
See SUPERCONDUCTING SUPER COLLIDER
DESONOX PROCESS
See COMBINED SOXNOX PROCESSES
DESOREX PROCESS
See DESULFURIZATION
DESORPTION
Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)
DESOXYRIBONUCLEIC ACID
See DNA
DESULFURIZATION
See also COMBINED SOXNOX PROCESSES
Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)
DETECTION (RADIATION)
See RADIATION DETECTION
DETECTORS (RADIATION)
See RADIATION DETECTORS
DEUTERIUM
Determination of the deuterium order-disorder structure transition in Pd-$DO_{.65}$ at '50K', 20:1127 (IA;AU)
DEUTERIUM OXIDE
See HEAVY WATER
DEUTERIUM-LITHIUM HIGH FLUX NEUTRON SOURCE FACILITY
See NEUTRON SOURCE FACILITIES
DEUTERON REACTIONS
New data on T_{20} in inclusive deuteron breakup at 9 GeV/c on protons and correlation between polarization observables, 20:2259 (R;XJ)
Polarization phenomena in deuteron-proton backward elastic scattering, d + p -> p + d, 20:2258 (R;XJ)
DEUTERON-DEUTERON INTERACTIONS
See DEUTERON REACTIONS
DEVELOPING COUNTRIES
See also ARGENTINA
BRAZIL
BULGARIA
CHILE
CZECH REPUBLIC
EGYPTIAN ARAB REPUBLIC
HUNGARY
INDIA
MEXICO
NIGERIA
NORTH KOREA
PAKISTAN
REPUBLIC OF KOREA
ROMANIA
SLOVAKIA
SPAIN
SRI LANKA
THAILAND
YUGOSLAVIA
Village power hybrid systems development in the United States, 20:1001 (R;US)
DEVICES
See EQUIPMENT
DIAMOND DRILLING EQUIPMENT
See DRILLING EQUIPMENT
DIAMONDS
Electron spin resonance and intrinsic stress measurements on diamond synthesized by plasma assisted chemical vapour deposition, 20:1253 (IA;AU)
Empirical molecular dynamics calculations for the (001) and (111) reconstructed surfaces of diamond, 20:2325 (IA;AU)
Low pressure growth of diamond films, 20:1182 (IA;AU)
Orientation and polarization effects in the Raman spectroscopy of (110) diamond faces in CVD deposited diamond films, 20:1257 (IA;AU)
Pulsed laser annealing of P implanted diamond, 20:1289 (R;AU)
Transverse microanalysis of 2.5 MeV H^+ damage in diamond, 20:2355 (IA;AU)
DIAMOX PROCESS
See DESULFURIZATION
DIBENZOPYRROLES
See CARBAZOLES
DIELECTRIC MATERIALS
External control of microwave properties of dielectric materials, 20:1211 (IA;AU)
Generation and solution of effective many-body Hamiltonians for rare earth and transition metal compounds, 20:2387 (R;US)
DIELECTRIC TRACK DETECTORS
Fibre tracking: An overview, 20:1648 (R;FR)
DIELECTRICS
See DIELECTRIC MATERIALS
DIES
Improved die castings through plasma surface modification, improved sensors and die soldering prevention: Quarterly progress report 1, July 1–September 30, 1994, 20:1112 (R;US)
DIESEL ENGINES
Long-time testing of the diagnosis and trend system for marine diesel engines: Final report, 20:1067 (I;DE;In German)
Study of diesel cycle with a new condition of restricting a cycle and the best values, 20:1069 (IA;JP;In Japanese)
DIESEL MOTORS
See DIESEL ENGINES
DIFFERENTIAL CROSS SECTIONS
Neutron measurement for the reactions induced by high-energy protons, 20:2255 (RA;JP)
DIFFERENTIAL EQUATIONS
See also NEUTRON DIFFUSION EQUATION
Nonexistence of global solutions to some quasilinear hyperbolic equations with dynamic boundary conditions, 20:1977 (R;XA)
Symbolic dynamics of the Lorenz equations, 20:2015 (R;XA)
DIFFRACTION (ELECTRON)
See ELECTRON DIFFRACTION
DIFFRACTION (NEUTRON)
See NEUTRON DIFFRACTION
DIFFRACTION (X-RAY)
See X-RAY DIFFRACTION
DIFFUSE SOLAR RADIATION
Atmospheric turbidity and the diffuse irradiance in Lagos, Nigeria, 20:1747 (R;XA)
Estimation and analysis of spectral solar radiation over Cairo, 20:640 (R;XA)
Predicting the components of the total hemispherical solar radiation from sunshine duration measurements in Lagos, Nigeria, 20:641 (R;XA)
DIFFUSION
Behaviour of the reaction front for A + B → C diffusion-reactions systems: An analytic approach, 20:2012 (R;XA)
Quantum diffusion, 20:2001 (R;US)
DIGESTER GAS
See METHANE
DINING CAR EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
DIODES (SEMICONDUCTOR)
See SEMICONDUCTOR DIODES
DIOXIN
Formation and degradation mechanisms of polychlorodibenzodioxins, polychlorodibenzofurans and other organic pollutants produced in waste incineration processes: Final report, 20:1346 (I;DE;In German)
Results of monitoring for PCDDs and PCDFs in ambient air at McMurdo Station, Antarctica, 20:1749 (R;US)
DIPHENYLPHOSPHINE OXIDE
See ORGANIC PHOSPHORUS COMPOUNDS

DIRAC COSMOLOGY
Relevance of induced gauge interactions in decoherence, 20:2045 (R;XA)
DIRAC MATRICES
See DIRAC OPERATORS
DIRAC OPERATORS
On the spectral density of Euclidean Dirac operator in QCD, 20:2091 (R;FR)
DISCHARGES (WASTES)
See WASTE DISPOSAL
DISCRETE ORDINATE METHOD
Fast algorithms for transport models: Final report, 20:2278 (R;US)
DISCRETE ORDINATES
See DISCRETE ORDINATE METHOD
DISMANTLEMENT (NUCLEAR WEAPONS)
See NUCLEAR WEAPONS DISMANTLEMENT
DISMANTLING (REACTOR)
See REACTOR DISMANTLING
DISPOSAL (WASTES)
See WASTE DISPOSAL
DISPROPORTIONATION
See OXIDATION
REDUCTION
DISSOLVED GASES
Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers, 20:639 (R;US)
DISSOLVED OXYGEN
See DISSOLVED GASES
OXYGEN
DISTILLATE FUEL
See HEATING OILS
DISTILLATE FUEL OIL
See HEATING OILS
DISTILLATES
See also NAPHTHA
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 23: Quarterly technical progress report for third quarter fiscal year 1992 (April 1–June 30, 1992), 20:27 (R;US)
DISTRIBUTION FUNCTIONS
Hits per trial: Basic analysis of binomial data, 20:802 (R;US)
DNA
Development of novel separation techniques for biological samples in capillary electrophoresis, 20:1865 (R;US)
Molecular mechanisms in radiation damage to DNA: Progress report, 20:1914 (R;US)
Transformation-associated recombination between diverged and homologous DNA repeats is induced by strand breaks, 20:1866 (R;US)
DNA ADDUCTS
Molecular views of damaged DNA: Adaptation of the Program DUPLEX to parallel architectures, 20:1948 (R;US)
DOCUMENT RETRIEVAL
See INFORMATION RETRIEVAL
DOMESTIC WASTES
See MUNICIPAL WASTES
DOPED MATERIALS
Defects in epitaxial GaInP, 20:1219 (IA;PL)
DOPPLERONS
See QUASI PARTICLES
DORMITORIES
See RESIDENTIAL BUILDINGS
DOSE RATES
Analysis of criticality alarm system response to an accidental criticality outside the cascade process buildings at the Portsmouth Gaseous Diffusion Plant, 20:151 (R;US)
DOSEMETERS
See also CALORIMETRIC DOSEMETERS
Digital area monitor, 20:1632 (IA;TH;In Thai)
DOSIMETERS
See DOSEMETERS
DOSIMETRY
See also ELECTRON DOSIMETRY
GAMMA DOSIMETRY
NEUTRON DOSIMETRY
PERSONNEL DOSIMETRY
THERMOLUMINESCENT DOSIMETRY
Pacific Northwest Laboratory annual report for 1993 to the DOE Office of Energy Research: Part 4: Physical sciences, 20:1941 (R;US)
DOUGLAS POINT SITE
See POWER PLANTS
DOWA PROCESS
See DESULFURIZATION
DPO
See ORGANIC PHOSPHORUS COMPOUNDS
DRAG EFFECT
See ELECTROPHORESIS
DRIFT CHAMBERS
Development of an induction drift chamber for experiments at COSY and high-rate effects according to a new method, 20:1645 (R;DE;In German)
DRILL BITS
Core sample truck improvement test report, 20:422 (R;US)
Test plan for core sampling drill bit temperature monitor, 20:534 (R;US)
DRILL HOLES
See BOREHOLES
DRILLING EQUIPMENT
See also DRILL BITS
Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas, 20:120 (R;US)
Phase I ResonantSonic CRADA report, 20:1496 (R;US)
DRINKING WATER
GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
Nationwide rural well water survey: The quality of household water and factors influencing it, 20:1842 (R;FI;In Finnish)
DROPLETS
Droplet size and velocity at the exit of a nozzle with two-component near critical and critical flow, 20:1463 (R;FR)
DRY DEPOSITION
See DEPOSITION
DRY STORAGE
CASCAD dry storage concept for spent fuel, 20:196 (RA;XA)
Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)
DTO
See HEAVY WATER
DUCTS
A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994, 20:78 (R;US)
DUST COLLECTORS
Improvement of a wet process for the separation of aerosols, 20:1762 (R;DE;In German)
DUSTS
Forest pollution with airborne pollutants. Pollutant measurement. 5. report: Evaluation and presentation of airborne dust measurements in forest areas in Hessen, 20:1744 (I;DE;In German)
DYE LASERS
Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)
DYMAC SYSTEM
See NUCLEAR MATERIALS MANAGEMENT
PLUTONIUM
DYNAMIC MATERIALS ACCOUNTABILITY SYSTEM
See NUCLEAR MATERIALS MANAGEMENT
PLUTONIUM
DYNAMICS
A neural network approach to the study of dynamics and structure of molecular systems, 20:2280 (R;US)

Coding chaotic billiards. Pt. 2: Compact billiards tiling the pseudosphere, 20:1994 (R;FR)
Coding chaotic billiards. Pt. 3: Non-tiling billiards defined on the pseudosphere, 20:1995 (R;FR)

DYNAMICS (BEAM)
See BEAM DYNAMICS

DYSPROSIUM 163
First measurements of the beta decay into bound states of the electron: $^{163}_{66}Dy^{66+} \rightarrow ^{163}_{67}Ho^{66+}$ + anti ν_e, 20:2225 (R;DE;In German)

DYSPROSIUM 163 TARGET
Spin dependent pre-equilibrium formation in the $^{163}Dy(^3He,\alpha)$ reaction, 20:2274 (R;NO)

DYSPROSIUM ALLOYS
Magnetization and magnetostriction in highly magnetostrictive materials, 20:1145 (R;US)
Phase formation at the Fe-rich end of Dy-Fe-Ti system, 20:1124 (IA;AU)

DYSPROSIUM ISOTOPES
See also DYSPROSIUM 163
Spin dependent pre-equilibrium formation in the $^{163}Dy(^3He,\alpha)$ reaction, 20:2274 (R;NO)

E

E CODES
EDFOR version 5.6: User guide and reference manual, 20:2550 (R;FR)

EARTH ATMOSPHERE
See also IONOSPHERE
TROPOSPHERE
Large eddy simultations of the atmospheric boundary layer east of the Colorado Rockies, 20:1764 (R;US)
Lidar technologies for airborne and space-based applications, 20:1666 (R;US)
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)

EASTERN EUROPE
See also BULGARIA
CZECH REPUBLIC
HUNGARY
ROMANIA
RUSSIAN FEDERATION
SLOVAKIA
YUGOSLAVIA
IAEA programmes on the safety of nuclear power plants in Easter Europe and countries of the former Soviet Union, 20:2493 (RA;XA)
Uranium deposits and production in Eastern Europe and the former Soviet Union, 20:142 (RA;US)

ECOLOGICAL COMMUNITIES
See ECOSYSTEMS

ECONOMIC ANALYSIS
Assessing energy projects from the viewpoint of individual economic branches and total economy: The role of economic efficiency analysis, cost-benefit analysis and multicriteria methods, 20:910 (I;DE;In German)
Development of brown coal liquefaction technology. 2.: Economical performance investigation on the brown coal liquefaction process, 20:43 (I;JP;In Japanese)
Survey on econometric analysis of petroleum substitution energy for fiscal 1993, 20:1094 (R;JP;In Japanese)

ECOSYSTEMS
See also AQUATIC ECOSYSTEMS
TERRESTRIAL ECOSYSTEMS
A phase-transition induced by the struggle for life in a competitive coexistence model in ecology, 20:2017 (R;XA)
Quantum mechanical analogy for solving a competitive coexistence model in ecology, 20:2016 (R;XA)
U.S. Fish and Wildlife Service lands biomonitoring operations manual, 20:1793 (R;US)

EDUCATION
See also TRAINING
Development of nuclear education, 20:2573 (IA;EG)
FEDIX: User's guide, Version 5.0/Release 3.0, 20:2568 (R;US)
National Information Infrastructure Education Forum: A summary report, 20:930 (R;US)

EDUCATIONAL FACILITIES
Manual for ERLE (Energy-Related Laboratory Equipment): Instructions and information for institutions of higher leaning concerning used energy-related laboratory equipment grants, 20:2454 (R;US)

EDUCATIONAL TOOLS
Medical University of South Carolina Environmental Hazards Assessment Program annual report, July 1, 1993–June 30, 1994, 20:2448 (R;US)

EFFLUENTS (CHEMICAL)
See CHEMICAL EFFLUENTS

EFFLUENTS (GASEOUS)
See GASEOUS WASTES

EFFLUENTS (LIQUID)
See LIQUID WASTES

EFFLUENTS (RADIOACTIVE)
See RADIOACTIVE EFFLUENTS

EFFLUENTS (THERMAL)
See THERMAL EFFLUENTS

EFFUSION
See DIFFUSION

EGYPTIAN ARAB REPUBLIC
Estimation and analysis of spectral solar radiation over Cairo, 20:640 (R;XA)

EINSTEIN GRAVITATION THEORY
See GENERAL RELATIVITY THEORY

EINSTEIN-DE SITTER MODEL
See COSMOLOGICAL MODELS

EINSTEINIUM 254 TARGET
Radiochemical search for neutron-rich isotopes of nielsbohrium in the $^{16}O + ^{254}Es$ reaction, 20:2241 (R;DE)

EINSTEINIUM ADDITIONS
See ALLOYS

EKA-RHENIUM
See ELEMENT 107

ELASTIC SCATTERING
Measurements of T_{20} in backward elastic d p scattering at deuteron momenta 3.5 - 6 GeV/c, 20:2260 (R;XJ)

ELECTRIC APPLIANCES
Study of efficient washing machines, dishwashers and driers: Interim report, 20:1049 (R;DK)

ELECTRIC BATTERIES
See also METAL-NONMETAL BATTERIES
Development of a tester for evaluation of prototype thermal cells and batteries, 20:1674 (R;US)
Effects of battery technologies, driving patterns, and climate comfort control on the performance of electric vehicles, 20:1073 (R;US)
The Utility Battery Storage Systems Program Overview, 20:726 (R;US)

ELECTRIC BRIDGES
Contact anomalies in the integral quantum Hall Effect, 20:1273 (IA;AU)

ELECTRIC CABLES
See also SUPERCONDUCTING CABLES
Thermal characteristics of electric cables with polypyrrole coated conductors, 20:1274 (IA;AU)

ELECTRIC CONDENSERS
See CAPACITORS

ELECTRIC CONDUCTORS
Gas cooled leads: This report consists of three independent parts, Part 1 covers the theory, Parts 2 and 3 present specific lead designs: Revision, 20:1542 (R;US)

ELECTRIC CONTACTS
Plasma-induced-damage of GaAs during etching of refractory metal contacts, 20:1287 (R;US)
Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures, 20:1137 (IA;AU)

ELECTRIC COOPERATIVES
See ELECTRIC UTILITIES

ELECTRIC FURNACES
See also ARC FURNACES
Glass science tutorial: Lecture #2, Operating electric glass melters, 20:331 (R;US)

ELECTRIC GENERATORS
Double-fed asynchronous machine with electronic inverter as 3 phase AC generator for constant frequency and voltage with variable speed drive, preferred as wave generator on ships. Vol. 2: Final report, 20:1435 (I;DE;In German)
Double-fed asynchronous machine with electronic inverter as 3 phase AC generator for constant frequency and voltage with variable speed drive, preferred as wave generator on ships. Vol. 1: Final report, 20:1436 (I;DE;In German)

ELECTRIC POWER
See also HYDROELECTRIC POWER
Electric power monthly, October 1994, 20:986 (R;US)
Information on electricity utilisation in animal breeding farms in the new Laender, 20:1044 (I;DE;In German)
Market and own load bulletin - August 1993, 20:890 (I;BR;In Portuguese)
Market and own load bulletin - July 1993, 20:889 (I;BR;In Portuguese)
Market and own load bulletin - June 1993, 20:888 (I;BR;In Portuguese)

ELECTRIC POWER INDUSTRY
Bayernwerk AG. Report on the 73rd business year from October 1, 1992 to September 30, 1993, 20:988 (I;DE;In German)
Electric power monthly, October 1994, 20:986 (R;US)
IRP and the electricity industry of the future: Workshop results, 20:994 (R;US)
Vereinigte Elektrizitaetswerke Westfalen (VEW). Annual report 1992, 20:987 (I;DE;In German)

ELECTRIC POWER SYSTEMS
See POWER SYSTEMS

ELECTRIC UTILITIES
Bayernwerk AG. Report on the 73rd business year from October 1, 1992 to September 30, 1993, 20:988 (I;DE;In German)
IRP and the electricity industry of the future: Workshop results, 20:994 (R;US)
Standardized equipment labeling program for electrical utilities, 20:996 (R;US)
Structure of the German electricity industry, 20:989 (I;DE;In German)
The Utility Battery Storage Systems Program Overview, 20:726 (R;US)
The role of DSM in a competitive market, 20:985 (R;US)
Vereinigte Elektrizitaetswerke Westfalen (VEW). Annual report 1992, 20:987 (I;DE;In German)

ELECTRIC-POWERED VEHICLES
See also HYBRID ELECTRIC-POWERED VEHICLES
EAGLES 1.1: A microcomputer software package for analyzing fuel efficiency of electric and gasoline vehicles, 20:1072 (R;US)
Effects of battery technologies, driving patterns, and climate comfort control on the performance of electric vehicles, 20:1073 (R;US)
Electric and Hybrid Vehicle Program: Site Operator Program: Quarterly progress report, October–December, 1993 (first quarter of fiscal year 1994), 20:1077 (R;US)
Electric and Hybrid Vehicles Program: Seventeenth annual report to Congress for Fiscal Year 1993, 20:1075 (R;US)
Exploratory Technology Research Program for electrochemical energy storage: Annual report for 1993, 20:897 (R;US)
Exploratory Technology Research Program for electrochemical energy storage: Executive summary report for 1993, 20:896 (R;US)
Kansas State University, DOE/KEURP site operator program: Year 4 first quarter report, June 1–August 31, 1994, 20:1076 (R;US)
Performance testing of the AC propulsion ELX electric vehicle, 20:1078 (R;US)
Photovoltaic solar filling station Hannover Fair 1988: Final report, 20:1079 (R;DE;In German)

ELECTRICAL ENGINEERING
Information on electricity utilisation in animal breeding farms in the new Laender, 20:1044 (I;DE;In German)

ELECTRICAL EQUIPMENT
See also CAPACITORS
ELECTRIC BRIDGES
ELECTRIC CONTACTS
RELAYS
TRANSFORMERS
An evaluation of the fire barrier system thermo-lag 330-1, 20:812 (R;US)
Effect of a solid insulator on the spark yield of S_2F_{10} in SF_6*, 20:887 (R;US)
Evaluation of near-field earthquake effects, 20:1456 (R;US)
Standardized equipment labeling program for electrical utilities, 20:996 (R;US)

ELECTRICAL PROPERTIES
See also POLARIZABILITY
THERMOELECTRIC PROPERTIES
On the effects of gravitational fields on the electrical properties of matter, 20:2006 (R;AU)

ELECTRICITY
Electricity demand forecasting techniques, 20:891 (I;LK)
Electricity pricing, 20:892 (I;LK)

ELECTROCATALYSTS
IGR NO_x/SO_x control technology: [Progress report], April 1–June 30, 1994, 20:736 (R;US)

ELECTROCHEMICAL CELLS
See also ELECTRIC BATTERIES
FUEL CELLS
Exploratory Technology Research Program for electrochemical energy storage: Annual report for 1993, 20:897 (R;US)
Exploratory Technology Research Program for electrochemical energy storage: Executive summary report for 1993, 20:896 (R;US)

ELECTRODES
See also ANODES
Composition and cycle life of multicomponent AB_5 hydride electrodes, 20:895 (R;US)

ELECTROLYTE TILES
See MATRIX MATERIALS

ELECTROMAGNETIC FIELDS
A superfield generalization of the classical action-at-a-distance theory, 20:2047 (R;XA)
Implementation plan for engineering research, development and demonstration, 20:1970 (R;US)

ELECTROMAGNETIC RADIATION
See also GAMMA RADIATION
LASER RADIATION
X RADIATION
Fluctuations and electromagnetic wave scattering in macroscopically agitated plasma: effects of turbulent diffusion, 20:2415 (R;UA)
Two dimensional Bose plasma in a magnetic field, 20:2428 (R;AU)

ELECTROMAGNETIC WAVES
See ELECTROMAGNETIC RADIATION

ELECTROMAGNETISM
Electromagnetic response of high-Tc thick films, 20:2374 (IA;AU)

ELECTROMIGRATION
See ELECTROPHORESIS

ELECTRON ACCEPTOR
See ELECTRONS

ELECTRON ANTINEUTRINOS
First measurements of the beta decay into bound states of the electron: $^{163}_{66}Dy^{66+} \rightarrow {}^{163}_{67}Ho^{66+}$ + anti ν_e, 20:2225 (R;DE;In German)

ELECTRON BEAMS
Monte Carlo calculation of electron beam dose distribution in water, 20:606 (RA;JP;In Japanese)
Update on the ATF inverse Cerenkov laser acceleration experiment, 20:1514 (R;US)
Very high-power electron-beam transport in long gas cells from 10^{-3} to 10^3 Torr N_2, 20:1592 (R;US)

ELECTRON CONFIGURATION (ATOMS)
See ELECTRONIC STRUCTURE

ELECTRON CORRELATION
Physics of correlated studies: Final report, September 1, 1990–November 30, 1993, 20:2292 (R;US)

ELECTRON CYCLOTRON MASERS
See MICROWAVE AMPLIFIERS

ELECTRON DENSITY
(e, 2e) measurements of thin graphite film, 20:1255 (IA;AU)

ELECTRON DIFFRACTION
A study of the Cu_3 Au(110) surface using low energy ion scattering, 20:1126 (IA;AU)

ELECTRON DONOR
See ELECTRONS

ELECTRON DOSIMETRY
The applied L-glutamine in gamma and electron dosimetry, 20:1639 (IA;PL)

ELECTRON GAS
Edge phonoconductivity in a magnetically quantised two-dimensional electron gas, 20:1128 (IA;AU)
Quantum well plasma effects in the tunneling current through a semiconductor double barrier structure, 20:2344 (IA;AU)
The freezing of 2D electron liquid in a random potential, 20:1129 (IA;AU)

ELECTRON HOLES
See HOLES

ELECTRON MICROPROBE ANALYSIS
Zirconium X-ray emission spectra by an electron probe micro analyser, 20:2286 (IA;AU)

ELECTRON NEUTRINOS
See also ELECTRON ANTINEUTRINOS
Neutrino mass and oscillation angle phenomena within the asymmetric left-right models, 20:2192 (R;XA)

ELECTRON PAIRS
Dilepton production from p-p to Ca-Ca at the Bevalac, 20:2178 (R;US)

ELECTRON PARAMAGNETIC RESONANCE
See ELECTRON SPIN RESONANCE

ELECTRON SPIN RESONANCE
An ESR study of gamma irradiated polycrystalline methionine-containing peptides, 20:1399 (IA;PL)
An ESR study of sulfur-containing amino acids in aqueous frozen solution, 20:1393 (IA;PL)
Anisotropic quantum spin fluid and anisotropic quantum spin glass formation in La-cuprate-based catalysts for phenol oxidation, 20:1351 (IA;PL)
EPR in fullerenes, 20:1350 (IA;PL)
EPR spectroscopy as a tool for radiation exposure measurements on living animals in environment after nuclear contamination, 20:1402 (IA;PL)
EPR studies of reduced Zn-chlorins and their isotope substituted analogs, 20:1904 (IA;PL)
ESR and pulse radiolysis on the free-radical-induced oxidation of phloroglucinol in aqueous solution, 20:1388 (IA;PL)
ESR studies of radiation damage of DNA and proteins, 20:1387 (IA;PL)
ESR study of radiation induced radicals in solid peptides, 20:1394 (IA;PL)
Photochemical and radiation-chemical aspects of matrix acidity effects on organic sulphur compounds, 20:1401 (IA;PL)
Pulse radiolysis studies of short-lived species in solid amino acids as precursors of radicals detected by ESR, 20:1386 (IA;PL)

ELECTRON-ELECTRON INTERACTIONS
Discovering supersymmetry with electron and photon beams, 20:2138 (RA;DE)

ELECTRON-HOLE COUPLING
Charge density wave and Wigner crystal instabilities in electron-hole systems, 20:2367 (IA;AU)

ELECTRON-ION COLLISIONS
On different models to deal with collisions between ionic and electronic populations, 20:2402 (R;FR;In French)

ELECTRON-POSITRON INTERACTIONS

Annihilation
A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S), 20:2146 (R;DE)
A precision measurement of the branching ratio $\Gamma_{bar{b}b}/\Gamma_{had}$ in the e^+e^- annihilation on the Z^0 resonance, 20:2180 (R;DE;In German)
Anomalous selfinteractions of gauge bosons in WWZ and ZZZ production at NLC, 20:2118 (RA;DE)
Approximation for on-shell W-pair production at high and intermediate energies, 20:2111 (RA;DE)
Aspects of scalar lepton search, 20:2137 (RA;DE)
Azimuthal distributions for the process $e^+e^-\rightarrow t$ anti $t\rightarrow\mu^+\mu^-X$, 20:2124 (RA;DE)
CP violation in top quark pair production, 20:2125 (RA;DE)
Changed Higgs boson discovery potential at a 500 GeV e^+e^- linear collider, 20:2109 (RA;DE)
Correlations in Higgs production and decay as a probe of CP-violation in the scalar sector, 20:2104 (RA;DE)
Detecting the non-minimal supersymmetric Higgs boson at the NLC, 20:2187 (RA;DE)
Gauge invariance in off-shell W pair production, 20:2110 (RA;DE)
Higgs bosons: Intermediate mass range at e^+e^- colliders, 20:2101 (RA;DE)
Higgs effects in top production, 20:2126 (RA;DE)
Initial stet radiation corrections to off-shell W-pair production in e^+e^--annihilation, 20:2112 (RA;DE)
Invisibly decaying Higgs boson at e^+e^- collisions, 20:2105 (RA;DE)
Measurement of the decay fractions of D^* mesons, 20:2144 (R;DE)
Measurements in the $e^+e^-\rightarrow t$ anti t threshold region, 20:2128 (RA;DE)
Model independent constraints on extra Z bosons at a 500 GeV e^+e^- collider, 20:2130 (RA;DE)
Perspectives of neutral supersymmetric Higgs boson searches at a 500 GeV e^+e^- linear collider, 20:2106 (RA;DE)
Production and decay of t anti t pairs in the threshold region, 20:2127 (RA;DE)
Production of a Higgs with two gauge bosons, 20:2102 (RA;DE)
Radiative corrections to $e^+e^-\rightarrow\mu^+\mu^-$ and the top decay $t\rightarrow bW$ in the Two Higgs doublet model, 20:2108 (RA;DE)
Radiative corrections to leptoquark pair production in e^+e^- annihilation, 20:2135 (RA;DE)
Radiative corrections to the supersymmetric Higgs sector, 20:2107 (RA;DE)
Search for neutral particles in nonminimal SUSY model, 20:2189 (RA;DE)
Single W production at NLC, 20:2116 (RA;DE)
Strong resonances effects at future e^+e^- colliders, 20:2133 (RA;DE)
T-odd asymmetry in chargino pair production processes, 20:2139 (RA;DE)
Tests of trilinear couplings of the vector bosons at future e^+e^--collider, 20:2115 (RA;DE)
The BESS model at e^+e^- colliders, 20:2132 (RA;DE)
Trilinear and quadrilinear W couplings in triple vector production, 20:2117 (RA;DE)
Upper limit determination for the τneutrino mass with OPAL detector, 20:2185 (R;DE;In German)
Vector bosons and Higgs bosons as signatures for charginos and neutralinos, 20:2136 (RA;DE)
Z - Z' and exotic lepton mixing in $e^+e^-\rightarrow W^+W^-$ at high energy with polarized beams, 20:2131 (RA;DE)

Charged-Current Interactions
Higgs bosons: Intermediate mass range at e^+e^- colliders, 20:2101 (RA;DE)
Invisibly decaying Higgs boson at e^+e^- collisions, 20:2105 (RA;DE)

Electroproduction
W, Z and H bosons in the three particle final states production at TeV energy γe and $\gamma\gamma$colliders, 20:2142 (RA;DE)

Inelastic Scattering
Single production of new leptons, 20:2134 (RA;DE)
Meetings
e^+e^- collisions at 500 GeV: The physics potential. Pt. C: Proceedings, 20:2100 (R;DE)
Quasi-Elastic Scattering
Pair neutral gauge boson production and Higgs signal in γ-γcollisions: $\gamma\gamma \rightarrow \gamma\gamma$, $\gamma\gamma \rightarrow$ ZZ, $\gamma\gamma \rightarrow$ HH, 20:2141 (RA;DE)
Reviews
Studies of QCD in e^+e^- collisions at 500 GeV, 20:2129 (RA;DE)

ELECTRON-PROTON INTERACTIONS
Comparison of energy flows in deep inelastic scattering events with and without a large rapidity gap, 20:2145 (R;DE)
Measurement of the structure function F_2 of the proton in deep inelastic e-p scattering with the H1 detector at the HERA storage ring, 20:2179 (R;DE;In German)
Model independent QED corrections to the process ep → eX, 20:2158 (R;XA)
Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha^2_s)$, 20:2143 (R;DE;In German)
Physics from the first year of H1 at HERA, 20:2147 (R;DE)

ELECTRONIC DATA PROCESSING
See DATA PROCESSING

ELECTRONIC EQUIPMENT
See also MICROWAVE EQUIPMENT
Prosperity Games prototyping with the American Electronics Association, March 8–9, 1994, 20:1050 (R;US)
Survivability of soldered leadless chip carriers after temperature cycling, 20:1500 (R;US)

ELECTRONIC STRUCTURE
Electronic structural changes in Y_{1-x} Pr_x Ba_2 Cu_3 $O_{7-\delta}$ single crystals due to Pr4f states, 20:2395 (IA;AU)
Electronic structure of graphite, diamond-like and graphitic amorphous carbon, 20:1259 (IA;AU)
Massively parallel studies of the electronic structure of disordered micro-crystallites of transition metal oxides, 20:1210 (IA;AU)

ELECTRONS
See also TRAPPED ELECTRONS
On the field theory of the extended-type electron, 20:2048 (R;XA)
Preformed transient gas channels for laser wakefield particle acceleration, 20:1522 (R;US)

ELECTROPHORESIS
Development of novel separation techniques for biological samples in capillary electrophoresis, 20:1865 (R;US)
Novel absorption detection techniques for capillary electrophoresis, 20:1327 (R;US)

ELECTROSTATIC ACCELERATORS
See also PELLETRON ACCELERATORS
A 2.5 MeV electrostatic quadrupole dc accelerator for BNCT application, 20:1890 (R;US)

ELECTROSTATIC PRECIPITATORS
Development of the integrated environmental control model: Performance and cost models for electrostatic precipitators: Quarterly progress report, 20:737 (R;US)

ELECTROSTATIC WAVES
See PLASMA WAVES

ELECTROWEAK MIXING ANGLE
See WEINBERG ANGLE

ELEMENT 107
Modeling a nielsbohrium (element 107) on-line gas phase separation procedure with rhenium, 20:1299 (R;DE)

ELEMENTARY PARTICLES
See also BEAUTY PARTICLES
CHARM PARTICLES
HADRONS
LEPTONS
STRANGE PARTICLES
On a new type of long-range forces, 20:2056 (R;XJ)

ELLIOT MODEL
The microscopical two axial rotators model for the nucleus with the different neutron and proton shell configurations, 20:2229 (R;UA;In Russian)

EMBRITTLEMENT
Neutron spectrum effect on PV-steels embrittlement: dosimetry and qualification of irradiation locations in Osiris and Siloe reactors, 20:756 (R;FR)

EMERGENCY ENERGY CONSERVATION ACT
See EMERGENCY PLANS
ENERGY CONSERVATION

EMERGENCY PLANS
Guidelines for attendance and registration for radiological emergencies of nuclear accidents, 20:2577 (I;BR;In Portuguese)

EMERGENCY PROVISIONS
See EMERGENCY PLANS

EMISSION
See also ION EMISSION
Identification and analysis of data sources for data bases on greenhouse gas emissions in Germany not resulting from energy conversion processes: Study within IKARUS project, sub-project 9, 20:1760 (R;DE;In German)

EMITTANCE (BEAM)
See BEAM EMITTANCE

EMPLOYEES
See PERSONNEL

ENCAPSULATION
Clad vent set cup open end (closure weld zone) wall-thickness study, 20:819 (R;US)

ENDF
See NUCLEAR DATA COLLECTIONS

ENDOSTEUM
See BONE TISSUES

ENERGY
See also GEOTHERMAL ENERGY
NUCLEAR ENERGY
SOLAR ENERGY
Monthly energy review, October 1994, 20:923 (R;US)

ENERGY CONSERVATION
Energy concept Mainz: Analysis and assessment of scenarios and measures for CO_2 abatement, 20:1058 (I;DE;In German)
Energy conservation at the customer's: Financial support models of municipal utility companies, 20:971 (I;DE;In German)
Energy conservation: renewable energy sources: Information and consulting in Bavaria. As of July 1992, 20:1062 (I;DE;In German)
Whole-building energy targets "A" prototype, initial version, 20:1031 (R;US)

ENERGY CONSUMPTION
Do we need a tax on energy or CO_2?, 20:919 (I;DE;In German)
Effects of battery technologies, driving patterns, and climate comfort control on the performance of electric vehicles, 20:1073 (R;US)
Monthly energy review, October 1994, 20:923 (R;US)
Possibility of introducing heat storage technologies to Hokkaido, 20:894 (R;JP;In Japanese)
Survey on the actual energy consumption status for the residential/economical use, 20:998 (R;JP;In Japanese)

ENERGY CONVERSION
See also SOLAR ENERGY CONVERSION
How free is the research sector?: Lectures, 20:2451 (I;DE;In German)

ENERGY DEMAND
Energy profiles of selected Latin American and Caribbean countries: Report series No. 2, 20:974 (R;US)
Regional overview of Latin American and Caribbean energy production, consumption, and future growth: Report series No. 1, 20:973 (R;US)

ENERGY FACILITIES
Descriptions of representative contaminated sites and facilities within the DOE complex, 20:511 (R;US)
Radiological implications of contact maintenance: Impacts on facility design, 20:415 (R;US)

ENERGY LEVELS
See also EXCITED STATES
States above a quantum well in tilted magnetic fields, 20:2368 (IA;AU)

ENERGY MODELS
The Schleswig-Holstein energy model, 20:905 (I;DE;In German)
ENERGY OPERATORS
See HAMILTONIANS
ENERGY POLICY
China
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
Comparative Evaluations
Case Studies, 20:799 (I;LK)
Denmark
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Electric Power Industry
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
Feasibility Studies
Case Studies, 20:799 (I;LK)
Federal Republic Of Germany
Energy policy goals: Energy concept for Hanover. Module 1, 20:978 (I;DE;In German)
Energy supply on community level between communal and external supply concepts: Tasks and limits, problems and concepts of energy supply in urban and rural districts. Documentation, 20:1056 (I;DE;In German)
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Finland
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Hong Kong
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
Investigations
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
Meetings
Energy supply on community level between communal and external supply concepts: Tasks and limits, problems and concepts of energy supply in urban and rural districts. Documentation, 20:1056 (I;DE;In German)
Norway
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Planning
Case Studies, 20:799 (I;LK)
Poland
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Political Aspects
Energy policy goals: Energy concept for Hanover. Module 1, 20:978 (I;DE;In German)
Recommendations
Energy policy goals: Energy concept for Hanover. Module 1, 20:978 (I;DE;In German)
Regional Analysis
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
Regional Cooperation
Energy supply on community level between communal and external supply concepts: Tasks and limits, problems and concepts of energy supply in urban and rural districts. Documentation, 20:1056 (I;DE;In German)
Sweden
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
ENERGY RESEARCH ADVISORY BOARD
See RESEARCH PROGRAMS
ENERGY SOURCE DEVELOPMENT
Introduction to the national energy situation, 20:909 (I;LK)
Possibility of introducing new energy technologies to the South Pacific island countries, 20:1000 (R;JP;In Japanese)
ENERGY SOURCES
See also FOSSIL FUELS
NUCLEAR FUELS
RENEWABLE ENERGY SOURCES
WOOD FUELS
Conceptual study of model introduced to utilize wastes as energy in Hokkaido, 20:1048 (R;JP;In Japanese)
ENERGY SUBSTITUTION
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
ENERGY SUPPLIES
Annual report 1993 of the German Gas and Water Supply Acco-ciation (DVGW), 20:983 (I;DE;In German)
East German energy supply in transition: From a planned economy to a market economy, 20:903 (I;DE;In German)
Energy supply on community level between communal and external supply concepts: Tasks and limits, problems and concepts of energy supply in urban and rural districts. Documentation, 20:1056 (I;DE;In German)
Information on electricity utilisation in animal breeding farms in the new Laender, 20:1044 (I;DE;In German)
The Schleswig-Holstein energy model, 20:905 (I;DE;In German)
The energy economy in countries bordering the Baltic Sea: Baltic Sea yearbook 1991, 20:902 (I;DE;In German)
ENERGY-LEVEL SCHEMES
See ENERGY LEVELS
ENGINEERING
See also ELECTRICAL ENGINEERING
ENVIRONMENTAL ENGINEERING
Engineering faculty forum: Final report, June 1, 1993–May 31, 1994, 20:926 (R;US)
ENGINEERING DRAWINGS
Engineering drawing field verification program: Revision 3, 20:423 (R;US)
ENGINEERING PERSONNEL
See ENGINEERS
ENGINEERS
Engineering faculty forum: Final report, June 1, 1993–May 31, 1994, 20:926 (R;US)
ENGINES
See also HEAT ENGINES
Feasibility study of power generation system with shape memory alloys, 20:1159 (R;JP;In Japanese)
ENGLAND
See UNITED KINGDOM
ENHANCED RECOVERY
A model technology transfer program for independent operators: Kansas Technology Transfer Model (KTTM), 20:112 (R;US)
An evaluation of known remaining oil resources in the United States: Appendix, Project on Advanced Oil Recovery and the States, 20:106 (R;US)
An evaluation of known remaining oil resources in the United States: Project on advanced oil recovery and the states: Volume 1, 20:107 (R;US)
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)
An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)
Dynamic enhanced recovery techniques: Quarterly technical report, July 1994–September 1994, 20:116 (R;US)
ENRICHED URANIUM
See also HIGHLY ENRICHED URANIUM
Uranium Enrichment, an overview, 20:147 (R;FR)
ENRICHMENT (ISOTOPIC)
See ISOTOPE SEPARATION

ENRICHMENT PLANTS (CENTRIFUGE)
See CENTRIFUGE ENRICHMENT PLANTS
ENVIRONMENT
Environment, 1980-1993: International Atomic Energy Agency publications, 20:2513 (I;XA)
The management of site contamination, 20:1701 (IA;PL)
ENVIRONMENTAL EFFECTS
Importance of the genetic structure in tree species for forest ecosystems under the influence of air pollutants, 20:1962 (IA;DE)
ENVIRONMENTAL ENGINEERING
Survey report on geothermal energy development and the environment (landscape). 2, 20:715 (R;JP;In Japanese)
ENVIRONMENTAL IMPACTS
Development of nuclear power in Sweden, 20:965 (IA;PL)
Environmentally Conscious Manufacturing Project: Maine metal products association: [Quarterly] status report, July 1–September 30, 1994, 20:1039 (R;US)
Report of the Chernobyl state committee of the Republic of Belarus, 20:837 (IA;PL)
ENVIRONMENTAL MATERIALS
Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)
ENVIRONMENTAL POLICY
Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Energy and the environment: Investigation carried out by the Energy Conservation Committee on the attitudes and behaviour of the public in relation to environmental protection and energy conservation, 20:979 (R;DK;In Danish)
Environmental Protection implementation plan for the Waste Isolation Pilot Plant, November 9, 1994, to November 9, 1995, 20:251 (R;US)
Lawrence Berkeley Laboratory 1993 Site Environmental Report, 20:921 (R;US)
Levies as instruments of environment protection: aspects of water and energy economy, 20:917 (I;DE;In German)
Low-level waste vitrification plant environmental permitting plan, 20:405 (R;US)
ENVIRONMENTAL QUALITY
See also WATER QUALITY
1993 environmental monitoring report for the naval reactors facility, 20:460 (R;US)
Facility effluent monitoring plan for the B plant, 20:324 (R;US)
ENVIRONMENTAL TRANSPORT
See also RADIONUCLIDE MIGRATION
RUNOFF
GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico, 20:459 (R;US)
Support of the EMEP-project: European wide depositions of sulphur and nitrogen compounds as a consequence of sulphur, nitrogen oxides and ammonia emissions, 20:1745 (R;DE;In German)
EPDM
See ETHYLENE PROPYLENE DIENE POLYMERS
EPIPHYSIS (BONES)
See BONE TISSUES
EPOXIDES
Experimental studies on long-term thermal degradation of enclosed neutron shielding resin, 20:1248 (IA;JP)
EPOXY COMPOUNDS
See EPOXIDES
EPR
See ELECTRON SPIN RESONANCE
EQUATIONS (DIFFERENTIAL)
See DIFFERENTIAL EQUATIONS
EQUIPMENT
See also COMPACTORS
CONTROL EQUIPMENT
DRILLING EQUIPMENT
ELECTRICAL EQUIPMENT
ELECTRONIC EQUIPMENT
LABORATORY EQUIPMENT
MATERIALS HANDLING EQUIPMENT
POLLUTION CONTROL EQUIPMENT
REMOTE VIEWING EQUIPMENT
SAMPLERS
SOLAR EQUIPMENT
THERMAL ENERGY STORAGE EQUIPMENT
Investigation on the development of coprocessing technology, 20:50 (R;JP;In Japanese)
EQUIPMENT INTERFACES
Communication VME-KK009 interface to control CAMAC equipment, 20:1641 (R;XJ;In Russian)
The use of DBMS and document oriented interface in the TPLAN-system, 20:2544 (R;XJ)
ERBIUM ALLOYS
Magnetic properties of $Er\ Co_{12}\ B_6$:^{57} Fe, 20:1135 (IA;AU)
ESR
See ELECTRON SPIN RESONANCE
ESR STORAGE RING
Production and study of pulsed heavy-ion beams of highest phase-space density in the GSI experimental storage ring, 20:1603 (R;DE;In German)
ESTUARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
ETA MESONS
π-η mixing from QCD sum rules, 20:2081 (R;US)
Total d+d $\rightarrow$ α+η cross sections near threshold, 20:2252 (R;FR)
ETA-549
See ETA MESONS
ETHANE
Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)
ETHANOL
A low energy continuous reactor separator for the production of ethanol from corn grits/starch and biomass streams: 2nd Quarterly report, August 1–October 15, 1994, 20:620 (R;US)
Investigation on continuous ethanol production using Zymomonas mobilis: Final report, 20:622 (I;DE;In German)
ETHANOL FUELS
Bench-scale demonstration of biological production of ethanol from coal synthesis gas: Quarterly report, April 1, 1994–June 30, 1994, 20:36 (R;US)
ETHERS
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 33: Quarterly technical status report for third quarter fiscal year 1993 (April 1–June 30, 1993), 20:30 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993), 20:29 (R;US)
Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)
ETHOCEL
See CELLULOSE
ETHERS
ETHYL ALCOHOL
See ETHANOL
ETHYLENE
Aging tests of ethylene contaminated argon/ethane, 20:1625 (R;US)
ETHYLENE PROPYLENE DIENE POLYMERS
Development of highly effective neutron shields and neutron absorbing materials, 20:1249 (IA;JP)
ETRR-1 REACTOR
A two dimensional code (R,Z) for nuclear reactor analysis and its application to the UAR-RI reactor, 20:840 (R;EG)

EUROPE
See also EASTERN EUROPE
USSR
Assistance to nuclear power user countries under the IAEA Technical Co-operation Programme, 20:2487 (RA;XA)
Outline of an on-site inspection regime for conventional arms control in Europe, 20:1679 (R;US)
Support of the EMEP-project: European wide depositions of sulphur and nitrogen compounds as a consequence of sulphur, nitrogen oxides and ammonia emissions, 20:1745 (R;DE;In German)

EUROPEAN COMMUNITIES
Present status of petroleum substitution energy (EC), 20:1090 (R;JP;In Japanese)

EVALUATED NUCLEAR DATA FILE
See NUCLEAR DATA COLLECTIONS

EVAPORATION
Model of electronic energy relaxation in the test-particle Monte Carlo method, 20:148 (R;FR)

EVAPORATORS
200 Area weekly report, 20:182 (R;US)
242-A Campaign 94-1 post run document, 20:404 (R;US)
242-A Evaporator waste analysis plan: Revision 4, 20:401 (R;US)
95-1 Campaign evaporator boildown results, 20:382 (R;US)
Anti-foam System design description, 20:412 (R;US)

EVENT TREE ANALYSIS
See FAILURE MODE ANALYSIS

EXCESS COSTS
See COST

EXCHANGE (HEAT)
See HEAT TRANSFER

EXCHANGE (ION)
See ION EXCHANGE

EXCITED STATES
Excited states of mesons within the NJL model with the homogeneous vacuum gluon field, 20:2096 (R;XJ)
Multiphonon excitations in nuclei built with giant resonances, 20:2211 (R;FR)
Towards limiting temperatures in nuclei: The behaviour of collective motion, 20:2212 (R;FR)

EXCRETION ANALYSIS
See PERSONNEL MONITORING

EXHAUST GASES
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Reducing nitrogen oxides in exhaust gases by means of urea. Final report, 20:1087 (R;CH;In German)
Test results from the Department of Energy's pressurized fluidized bed combustion hot gas cleanup program, 20:18 (R;US)

EXPERIMENTAL FACILITIES (ACCELERATOR)
See ACCELERATOR FACILITIES

EXPERIMENTAL REACTORS
See also TOPAZ REACTOR
Communication dated 14 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:552 (R;XA;In Arabic, Chinese, English, French)
Communications dated 27 and 28 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:553 (R;XA;In Arabic, Chinese, English, French)
Statement dated 1 June 1994 by a spokesman for the Foreign Ministry of the Democratic People's Republic of Korea, 20:575 (R;XA;In Arabic, Chinese, English, French)

EXPLORATORY WELLS
Steamboat Hills exploratory slimhole: Drilling and testing, 20:712 (R;US)

EXPOSURE (RADIATION DOSES)
See RADIATION DOSES

EXTRACTION (SOLVENT)
See SOLVENT EXTRACTION

EXTRACTION CHROMATOGRAPHY
Elaboration of the universal method of radiochemical separation of molybdenum from irradiated biological samples for NAA purposes, 20:1323 (IA;PL)

F

FACILITIES (ACCELERATOR)
See ACCELERATOR FACILITIES

FACILITIES (EDUCATIONAL)
See EDUCATIONAL FACILITIES

FACILITIES (ENERGY)
See ENERGY FACILITIES

FACILITIES (MAINTENANCE)
See MAINTENANCE FACILITIES

FACILITIES (MILITARY)
See MILITARY FACILITIES

FACILITIES (NUCLEAR)
See NUCLEAR FACILITIES

FACILITIES (STORAGE)
See STORAGE FACILITIES

FACILITIES (TEST)
See TEST FACILITIES

FAILURE MODE ANALYSIS
Events in time: Basic analysis of Poisson data, 20:803 (R;US)
Hits per trial: Basic analysis of binomial data, 20:802 (R;US)

FANS
See BLOWERS

FAST FLUX TEST FACILITY REACTOR
See FFTF REACTOR

FASTENERS
A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores, 20:2556 (R;US)

FAULTLESS EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

FEDERAL REGION I
See USA

FEDERAL REGION II
See USA

FEDERAL REGION III
See USA

FEDERAL REGION IV
See USA

FEDERAL REGION IX
See USA

FEDERAL REGION V
See USA

FEDERAL REGION VI
See USA

FEDERAL REGION VII
See USA

FEDERAL REGION VIII
See USA

FEDERAL REGION X
See USA

FEDERAL REPUBLIC OF GERMANY
AFR storage in Germany - Possibilities and prospects, 20:197 (RA;XA)
Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Cooperation with CIS in training of NPP-Personnel. (Supported by German Government and European Community), 20:2500 (RA;XA)
Economics, funding and the influence of politics on the Wismut Program, 20:907 (RA;US)
German system for training and qualification of NPP-personnel, 20:2474 (RA;XA)
Preparation and conduct of simulator training in Germany, 20:2476 (RA;XA)

Present status of petroleum substitution energy (Germany), 20:1093 (R;JP;In Japanese)
Presentation of Germany, 20:2501 (RA;XA)
The German center for the simulator training of nuclear power plant personnel, 20:2475 (RA;XA)

FEED MATERIALS PLANTS
See also FEED MATERIALS PRODUCTION CENTER
Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Economics, funding and the influence of politics on the UMTRA Project, 20:908 (RA;US)
Groundwater remediation at UMTRA Sites, 20:485 (RA;US)
History of US uranium mining and milling, 20:940 (RA;US)
Quality assurance, documentation, and long-term monitoring, 20:484 (RA;US)
Tailings remediation at UMTRA Project Sites: Engineering practices, 20:482 (RA;US)
The UMTRA Project process and framework for execution, 20:481 (RA;US)
The Uranium Mill Tailings Radiation Control Act and its implementation from a regulatory perspective, 20:483 (RA;US)
The Uranium Mill Tailings Remedial Action Project, 20:479 (RA;US)

FEED MATERIALS PRODUCTION CENTER
Uranium removal from soils: An overview from the Uranium in Soils Integrated Demonstration program, 20:223 (R;US)

FEEDBACK
Algorithms for orbit control on SPEAR, 20:1608 (R;US)

FELDSPARS
Analysis of experimentally shocked minerals by NMR spectroscopy, 20:1285 (R;US)

FERMENTATION ALCOHOL
See ETHANOL

FERMI FLUID
See FERMI GAS

FERMI GAS
Statistical mechanics of magnetized pair Fermi gas, 20:2070 (R;AU)

FERMI LIQUID
See FERMI GAS

FERMI-DIRAC GAS
See FERMI GAS

FERMILAB COLLIDER DETECTOR
Data acquisition for the CDF SVX II upgrade, 20:1622 (R;US)
The E781 trigger and data acquisition system, 20:1623 (R;US)

FERMILAB TEVATRON
Optimizing the length of the stores and related effects, 20:1534 (R;US)

FERMIONS
See also LEPTONS
QUARKS
The two-fermion relativistic wave equations of Constraint Theory in the Pauli-Schroedinger form, 20:2053 (R;FR)

FERNALD PRODUCTION PLANT
See FEED MATERIALS PRODUCTION CENTER

FERRIC COMPOUNDS
See IRON COMPOUNDS

FERRITE GARNETS
Hyperfine magnetic fields of rare earths substituted ferrimagnetics, 20:1209 (IA;AU)

FERRITIC STEELS
A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)

FERROCYANIDES
Evaluation of FTIR-based analytical methods for the analysis of simulated wastes, 20:420 (R;US)
Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)

FERROELECTRIC MATERIALS
Rotational melting in displacive quantum paraelectrics, 20:2361 (R;XA)

FERROMAGNETIC MATERIALS
Faraday magnetometer for studying interstitially modified ferromagnets, 20:2380 (IA;AU)
Self-organized criticality in magnetization reversal, 20:2018 (IA;AU)

FERROMAGNETISM
Photoemission and ferromagnetism, 20:2310 (R;US)

FERROUS COMPOUNDS
See IRON COMPOUNDS

FERROX PROCESS
See DESULFURIZATION

FERTILIZER INDUSTRY
Preventing atmospheric ammonia emissions: A generator/regulator solution, 20:1704 (R;US)
U.S. fertilizer industry and the environment - from mine to farm, 20:1776 (R;US)

FERTILIZERS
Commercial fertilizers 1993, 20:1052 (R;US)
Preventing atmospheric ammonia emissions: A generator/regulator solution, 20:1704 (R;US)
Summary data 1992, 20:1051 (R;US)
The speciality fertilizer market–scope and issues, 20:1844 (R;US)

FFTF REACTOR
Advanced reactors transition fiscal year 1995 multi-year program plan WBS 7.3, 20:870 (R;US)

FIELD EFFECT TRANSISTORS
Complementary GaAs junction-gated heterostructure field effect transistor fabrication for integrated circuits, 20:2307 (R;US)
Complementary GaAs junction-gated heterostructure field effect transistor technology, 20:1505 (R;US)

FIELD EMISSION MICROSCOPY
See ION MICROSCOPY

FIELD ION MICROSCOPY
See ION MICROSCOPY

FIELD THEORIES
See also GENERAL RELATIVITY THEORY
QUANTUM FIELD THEORY
HyperKaehler metrics building and integrable models, 20:2040 (R;XA)
The generalized Erlangen program and setting a geometry for four- dimensional conformal fields, 20:2033 (R;US)

FIELDS (ELECTROMAGNETIC)
See ELECTROMAGNETIC FIELDS

FIELDS (MAGNETIC)
See MAGNETIC FIELDS

FILTERS
See also AIR FILTERS
MECHANICAL FILTERS
Ceramic fiber ceramic matrix filter development, 20:1492 (R;US)
Critically safety evaluation for K Basins sandfilters, 20:344 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines (moving bed, fluid bed contactor/ceramic filter): Twenty-seventh quarterly status report, April–June 1994, 20:10 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines: Twenty-sixth quarterly report: Quarterly status for the period January–March 1994, 20:9 (R;US)
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 3, Test plan, 20:13 (R;US)
On the thermal characteristics of diesel particulate filter, 20:1070 (IA;JP;In Japanese)

FINANCIAL MANAGEMENT
See PROGRAM MANAGEMENT

FINGERPRINTING (OIL SPILLS)
See OIL SPILLS

FINISHED OILS
See PETROLEUM PRODUCTS

FINLAND
Communications received from certain Member States regarding guidelines for the export of nuclear material, equipment and technology, 20:568 (R;XA;In Arabic, Chinese, English, French)
Evaluation of the Finnish nuclear waste management programme: Report of the WATRP review team, 20:285 (R;FI)

Finnish programme and experience on training and qualification for nuclear power plant personnel, 20:2471 (RA;XA)
Nationwide rural well water survey: The quality of household water and factors influencing it, 20:1842 (R;FI;In Finnish)
Nuclear energy research until 2000: The necessity of the nuclear energy research until the year 2000 and a proposal for the organizational model of the research, 20:2515 (R;FI;In Finnish)

FIRE FIGHTING
Fire protection program fiscal year 1995 site support program plan, Hanford Fire Department, 20:535 (R;US)

FIREDAMP
See METHANE

FIRES
The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)
Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G, 20:543 (R;US)

FIREWOOD
See WOOD FUELS

FISCHER-TROPSCH SYNTHESIS
Low severity upgrading of F-T waxes with solid superacids: Quarterly report, 1 June 1994–31 August 1994, 20:34 (R;US)

FISH AND WILDLIFE SERVICE
See US FWS

FISHES
Diel and seasonal white sturgeon (Acipenser transmontanus) movements in relation to Columbia River temperatures, 20:838 (R;US)
Exploratory studies of the interactions of gas supersaturation and temperature on mortality of juvenile salmonids, 20:637 (R;US)
Factors affecting the quality of fish caught by Native Americans in the Zone 6 fishery 1991 through 1993, 20:1858 (R;US)
New distribution records and notes on the life history and behavior of the sand roller, Percopsis transmontana (Eigenmann and Eigenmann), 20:835 (R;US)
Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers, 20:639 (R;US)
Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes, 20:494 (R;US)
The study of irradiated fish for prevention, 20:1903 (IA;TH)

FISSILE MATERIALS
Arms control and nonproliferation technologies, third quarter 1994: Dismantlement transparency, 20:547 (R;US)
Measurement technique of radwaste content: For TRU, 20:555 (IA;JP;In Japanese)
Performance report for a small package counter that uses active neutron interrogation, 20:559 (R;US)
Thermal modeling of packages for normal conditions of transport with isolation, 20:1429 (R;US)
User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations, 20:190 (R;US)

FISSION FRAGMENTS
New fission fragments discovered in collisions of relativistic ^{238}U ions with Pb target nuclei, 20:2251 (R;FR)

FISSION PRODUCTS
Magnetic separation for environmental remediation, 20:503 (R;US)
Methods for estimating the content of transuranium and other difficult to measure nuclides in produced rad waste from BWRs, 20:215 (R;SE)
Progress in fission product nuclear data. No. 14: Information about activities and requirements in the field of measurements and compiliations/evaluations of fission product nuclear data (FPND), 20:2242 (R;XA)
Spectrophotometric determination of inactive molybdenum in sodium pertechnetate (technetium-99m) for injection, 20:1311 (IA;TH;In Thai)
[Dispersion of fission products], 20:742 (R;US)

FISSIONABLE MATERIALS MANAGEMENT
See NUCLEAR MATERIALS MANAGEMENT

FISSURED FORMATIONS
See FRACTURED RESERVOIRS

FLAME PROPAGATION
Temporal evolution of turbulence/chemistry interactions in lifted, turbulent-jet flames, 20:1426 (R;US)

FLAMES
Aromatics oxidation and soot formation in flames: Progress report, August 15, 1993–June 30, 1994, 20:1420 (R;US)

FLASKS
See CASKS

FLAVOR MODEL
Comment on the average momentum of top quarks in the threshold region, 20:2076 (RA;DE)

FLAVORDYNAMICS
See QUANTUM FLAVORDYNAMICS

FLINTLOCK OPERATION
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

FLOORS
Floor tile and mastic removal project report, 20:1739 (R;US)

FLOTATION
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Sixteenth quarterly report, 14 May–13 August 1994, 20:1297 (R;US)

FLOW (FLUID)
See FLUID FLOW

FLOWMETERS
Further development of the seven-hole probe technique for steady flow measurements: Final report, 20:1472 (R;DE;In German)

FLUE GAS
Cryogenic separation of CO_2 from the flue gas of conventional coal-fired power plants, 20:734 (R;US)
Electron beam induced purification of air by removing the volatile organic compounds, 20:600 (IA;PL)
High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)
Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1993–June 30, 1993, 20:65 (R;US)
LIFAC Sorbent Injection Desulfurization Demonstration Project: Quarterly report number 14, January–March, 1994, 20:67 (R;US)
Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)
The laboratory unit of SO_2 and NO_x removal from flue gases by simultaneous use electron beam and streams of microwave energy, 20:601 (IA;PL)
The pilot plant for electron beam flue gas treatment. Two-stages irradiation test, 20:599 (IA;PL)
The possibility of application of ion chromatography for the determination of nitrogen and sulfur oxides and some other compounds in combustion flue gases after electron beam treatment, 20:591 (IA;PL)

FLUID FLOW
See also CRITICAL FLOW
GAS FLOW
INCOMPRESSIBLE FLOW
MULTIPHASE FLOW
POTENTIAL FLOW
TURBULENT FLOW
TWO-PHASE FLOW
VORTEX FLOW
A new paradigm for particle tracking velocimetry, based on graph-theory and pulsed neural network, 20:1462 (R;FR)
The numerical integration and 3-D finite element formulation of a viscoelastic model of glass, 20:1288 (R;US)

FLUID MECHANICS
See also HYDRODYNAMICS

Proceedings of the Twelfth Symposium on Energy Engineering Sciences: Fluid/thermal systems and dynamics, 20:1466 (R;US)

FLUID-STRUCTURE INTERACTIONS
A mixed time integration method for large scale acoustic fluid-structure interaction, 20:1452 (R;US)
Fluid structure interaction in L.M.F.B.R. cores. Flowering response to an impulse load, 20:789 (R;FR)

FLUIDIZED BED
See FLUIDIZED BEDS

FLUIDIZED BEDS
Robotic weld overlay coatings for erosion control, 20:90 (R;US)

FLUIDIZED-BED COMBUSTION
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)

FLUIDIZED-BED COMBUSTORS
Analysis/control of in-bed tube erosion phenomena in the fluidized bed combustion (FBC) system, 20:1490 (R;US)
Ceramem filters for removal of particles from hot gas streams, 20:60 (R;US)
Investigation of heat transfer and combustion in the advanced Fluidized Bed Combustor (FBC): Technical progress report No. 3, April 1, 1994–June 30, 1994, 20:1491 (R;US)
Predictive models of circulating fluidized bed combustors: 14th Technical progress report, 20:87 (R;US)
Robotic weld overlay coatings for erosion control, 20:90 (R;US)

FLUOR SOLVENT PROCESS
See DESULFURIZATION

FLUORINE 18
Radiopharmaceuticals for diagnosis: Final report, 20:1873 (R;US)

FLUORS
See PHOSPHORS

FLUX (MAGNETIC)
See MAGNETIC FLUX

FLUX JUMPS
See MAGNETIC FLUX

FLUX PINNING
See MAGNETIC FLUX

FLUXOIDS
See MAGNETIC FLUX

FLY ASH
Development of the integrated environmental control model: Performance and cost models for electrostatic precipitators: Quarterly progress report, 20:737 (R;US)
Solid waste sampling and distribution project: Sampling report #4, 20:62 (R;US)

FOILS
Some properties of foils and PTM made of different polymers irradiated by electrons, 20:598 (IA;PL)

FOOD
Proceedings of the 3. nuclear science and technology conference, 20:1380 (I;TH;In English, Thai)
Sensory evaluation of irradiated and non-irradiated mungbean during storage, 20:1902 (IA;TH;In Thai)

FOOD IRRADIATION
See FOOD PROCESSING

FOOD PROCESSING
Detection of irradiation treatment of foods, 20:1898 (IA;JP;In Japanese)
Experiences in selling irradiated produce at the retail level, 20:1896 (IA;JP)
Food irradiation in China: With emphasis on market testing and public acceptance, 20:1897 (IA;JP)

FOODSTUFFS
See FOOD

FORESTS
Case studies and general patterns of ion budgets in North American forests, 20:1816 (IA;DE)
Conservation and reconstruction of forests in the medium-range mountains of the German Democratic Republic under the impact of nuisances, 20:1815 (IA;DE;In German)
Critical loads for deposition of acid and nitrogen - do we know enough to make the concept useful?, 20:1813 (IA;DE)
Forest damage research programme. Research on atmospheric pollutant deposition in American forests, 20:1818 (IA;DE;In German)
Forest decline research in Northrhine-Westphalia at the regional research site Eggegebirge/Velmerstot, 20:1809 (IA;DE;In German)
Forest pollution with airborne pollutants. Pollutant measurement. 5. report: Evaluation and presentation of airborne dust measurements in forest areas in Hessen, 20:1744 (I;DE;In German)
Input-output balances of acids, heavy metals and nutrients, and compartments of accumulation and depletion in forest ecosystems, 20:1812 (IA;DE)
Natural and anthropogenic stress in spruce and beech ecosystems in the Solling project, 20:1808 (IA;DE)
On the research program forest decline at the site 'Postturm', forest district Farchau/Ratzeburg, 20:1807 (IA;DE;In German)
Possibilities and limits of fertilization and melioration liming (as measures to fight 'novel' forest disease), 20:1814 (IA;DE;In German)
Soil acidification: its extent, development during the last decades, and causes, 20:1820 (IA;DE;In German)

FORMING (MATERIALS)
See MATERIALS WORKING

FORTISSIMO REACTOR
See RAPSODIE REACTOR

FOSSIL FUEL RESERVES
See FOSSIL FUELS

FOSSIL FUELS
See also COAL
NATURAL GAS
OIL SHALES
PETROLEUM
Electric power monthly, October 1994, 20:986 (R;US)
Jointly sponsored research program: Quarterly technical progress report, April–June, 1994, 20:927 (R;US)
Ocean Margins Program: Closure on the global carbon cycle: Program description, 20:1845 (R;US)

FOSSIL-FUEL POWER PLANTS
500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide (NO_x) emissions from coal-fired boilers: Technical progress report, fourth quarter 1993, 20:84 (R;US)
Current status of SMPRs and manpower development for nuclear power, 20:798 (I;LK)
Current status of nuclear power development, 20:962 (I;LK)
Development of the integrated environmental control model: Performance and cost models for electrostatic precipitators: Quarterly progress report, 20:737 (R;US)
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994, 20:738 (R;US)
Remedial Investigation Report on Chestnut Ridge Operable Unit 2 (Filled Coal Ash Pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. Main Text, 20:735 (R;US)
STEAG and VEW, Bergkamen joint power plant. Annual report 1992, 20:740 (I;DE;In German)
Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)
Survey of 1993 coal production/utilization technology promotion subsidy area models.: Area model survey as measures for environmental load reduction (interim report), 20:1047 (R;JP;In Japanese)
VEW-Harpen Kraftwerk Werne oHG. Annual report 1992, 20:730 (I;DE;In German)

FOUCAULT CURRENT
See MAGNETIC FLUX

FOURIER TRANSFORM SPECTROMETERS
Evaluation of FTIR-based analytical methods for the analysis of simulated wastes, 20:420 (R;US)

FOURIER TRANSFORMATION
Synthetic aperture radar processing with polar formatted subapertures, 20:1667 (R;US)
The PROSAIC Laplace and Fourier Transform, 20:2532 (R;US)
FRACTURED FORMATIONS
See FRACTURED RESERVOIRS
FRACTURED RESERVOIRS
Geological and petrophysical characterization of the Ferron Sandstone for 3-D simulation of a fluvial-deltaic reservoir: Quarterly report, April 1, 1994–June 30, 1994, 20:96 (R;US)
Geomechanics of horizontally-drilled, stress-sensitive, naturally-fractured reservoirs, 20:123 (R;US)
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, January 1, 1994–March 31, 1994, 20:133 (R;US)
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, October 1, 1993–January 30, 1994, 20:132 (R;US)
FRAGMENTATION
Mechanochemically induced reduction of zircon sand, 20:1214 (IA;AU)
The influence of cationic and anionic surfactants on ball milled barium ferrite, 20:1178 (IA;AU)
FRAGMENTS (FISSION)
See FISSION FRAGMENTS
FRANCE
Annual Report 1993, 20:860 (R;FR)
Monthly results of measurements; April 1994, 20:1834 (R;FR;In French)
Monthly results of measurements; May 1994, 20:1835 (R;FR;In French)
Present status of petroleum substitution energy (France), 20:1092 (R;JP;In Japanese)
Study on the design of new spent fuel intermediate storage facilities in France, 20:195 (RA;XA)
FRANCIUM ISOTOPES
Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993, 20:2221 (R;US)
Parity nonconservation in radioactive atoms: An experimental perspective, 20:2295 (R;US)
FREE CONVECTION
See NATURAL CONVECTION
FREE ELECTRON LASERS
Milestone experiments for single pass UV/X-ray FELs, 20:1517 (R;US)
Prospects for high power Linac Coherent Light Source (LCLS) development in the 1000Å – 1Å wavelength range, 20:1526 (R;US)
Wavelength and power stability measurements of the Stanford SCA/FEL, 20:1524 (R;US)
FREE RADICALS
See RADICALS
FRESH WATER ECOSYSTEMS
See AQUATIC ECOSYSTEMS
FRIAMBIENT PROCESS
See COAL LIQUEFACTION
FRUIT FLIES
Effects of gamma radiation on fruit fly, Dacus zonatus (Saunders), 20:1901 (IA;TH;In Thai)
FTR REACTOR (RICHLAND)
See FFTF REACTOR
FUEL ADDITIVES
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993), 20:29 (R;US)
FUEL ASSEMBLIES
Fluid structure interaction in L.M.F.B.R. cores. Flowering response to an impulse load, 20:789 (R;FR)
The effect of grid assembly mixing vanes on critical heat flux values and azimuthal location in fuel assemblies, 20:760 (R;FR)
FUEL CANS
Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)
Technical Department report on Production Test No. 313-70-M: Behavior of Paul and Beekman cans washed and unwashed, 20:864 (R;US)
FUEL CELL CATALYSTS
See ELECTROCATALYSTS
FUEL CELL POWER PLANTS
Molten carbonate fuel cell product development test: Annual report, October 1992–September 1993, 20:1011 (R;US)
Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly status report, July–September 1993, 20:1009 (R;US)
Performance and cost analysis of monolithic solid oxide fuel cells, 20:1008 (R;US)
FUEL CELLS
See also COAL FUEL CELLS
NATURAL GAS FUEL CELLS
SOLID ELECTROLYTE FUEL CELLS
Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly status report, April 1993–June 1993, 20:1010 (R;US)
Performance and cost analysis of monolithic solid oxide fuel cells, 20:1008 (R;US)
FUEL CHANNELS
FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results, 20:863 (R;US)
FUEL COOLING INSTALLATIONS
See SPENT FUEL STORAGE
FUEL CYCLE
Nuclear development in Korea, 20:947 (I;XA)
Nuclear power, nuclear fuel cycle and waste management, 1980-1993: International Atomic Energy Agency publications, 20:2514 (I;XA)
FUEL ELEMENTS
See also FUEL PINS
FUEL PLATES
FUEL RODS
SPENT FUEL ELEMENTS
Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
Inventory calculation for an irradiated HTGR fuel element, 20:768 (R;EG)
LEU ^{99}Mo target fabrication and testing: Overview, status, and plans, 20:839 (R;US)
Revised variable goal exposure plans for C-II-N and C-II-E material, 20:856 (R;US)
Travel to Battelle Memorial Institute: Trip report, September 17, 24, and October 8, 1953, 20:152 (R;US)
Trip report, Metals and Controls Corporation, Attleboro, Mass. – September 3, 1953, 20:815 (R;US)
Weekly report November 18 to December 1, 1955: 300-M Area, Savannah River Plant, 20:845 (R;US)
FUEL FABRICATION PLANTS
See also MIXED OXIDE FUEL FABRICATION PLANTS
308 Building electrical load list and panel schedules, 20:886 (R;US)
FUEL GAS
See also NATURAL GAS
Advanced sulfur control concepts in hot-gas desulfurization technology: Quarterly report, April–June 1994, 20:16 (R;US)
Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)
Enviropower hot gas desulfurization pilot, 20:7 (R;US)
Facilitated transport ceramic membranes for high temperature H_2S removal, 20:17 (R;US)
FUEL OILS
See also HEATING OILS
Winter fuels report: Week ending November 11, 1994, 20:972 (R;US)
FUEL PELLETS
Characteristics of prototype TOPAZ-II fuel, 20:791 (R;US)
Clad vent set cup open end (closure weld zone) wall-thickness study, 20:819 (R;US)
FUEL PENCILS
See FUEL PINS

FUEL PINS
Weekly report - 100 Areas - April 28, 1955, 20:156 (R;US)
FUEL PLATES
An examination of the elastic structural response of the Advanced Neutron Source fuel plates, 20:607 (R;US)
FUEL POOLS
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)
The history and legacy of Project X, 20:522 (R;US)
FUEL RACKS
Current situation of spent fuel management in the Laguna Verde Nuclear Power Plant, Veracruz, Mexico, 20:202 (RA;XA)
FUEL REPROCESSING PLANTS
See also SELLAFIELD REPROCESSING PLANT
308 Building electrical load list and panel schedules, 20:886 (R;US)
PUREX irradiated fuel recovery simulation, 20:186 (R;US)
Sludge Stabilization Campaign blend plan, 20:338 (R;US)
The qualitative and fuzzy contributions for industrial process diagnostic. Application in the DIAPASON project, 20:163 (R;FR;In French)
To a cooperating approach for plant operator aid, 20:164 (R;FR;In French)
FUEL ROD CONSOLIDATION
See FUEL RODS
FUEL RODS
Communication dated 3 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:551 (R;XA;In Arabic, Chinese, English, French)
Modular bench for non destructive controls, 20:1481 (R;FR;In French)
The evaluation and demonstration of methods for improved nuclear fuel utilization: Final report, 20:762 (R;US)
FUEL SHEATHS
See FUEL CANS
FUEL SLUGS
See FUEL RODS
FUEL SLURRIES
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fourteenth quarterly report, 14 November 1993–13 February 1994, 20:1 (R;US)
Characterization of multiphase fluid flow during air-sparged hydrocyclone flotation by x-ray CT: Fifteenth quarterly report, 14 February 1994–13 May 1994, 20:2 (R;US)
Technical and economic assessment of the possible applications of highly concentrated coal-water-suspensions, 20:53 (R;DE;In German)
The physics of non-Newtonian liquid slurry atomization: Second quarterly technical report, April 1, 1994–June 31, 1994, 20:1493 (R;US)
FUEL STORAGE POOLS
Current situation of spent fuel management in the Laguna Verde Nuclear Power Plant, Veracruz, Mexico, 20:202 (RA;XA)
MBA acceptance test procedures, software Version 1.4, 20:566 (R;US)
Paradox applications integration ATP's for MAC and mass balance programs, 20:565 (R;US)
Safety assessment of discharge chute isolation barrier preparation and installation: Revision 1, 20:526 (R;US)
FUEL SUBSTITUTION
Present status of petroleum substitution energy (EC), 20:1090 (R;JP;In Japanese)
Present status of petroleum substitution energy (France), 20:1092 (R;JP;In Japanese)
Present status of petroleum substitution energy (Germany), 20:1093 (R;JP;In Japanese)
Present status of petroleum substitution energy (UK), 20:1091 (R;JP;In Japanese)
Present status of petroleum substitution energy (USA), 20:1089 (R;JP;In Japanese)
Promoted structuring of model to introduce petroleum substitution energy in Hokkaido's New City Base for Regional Administration of Industry and Culture, 20:1060 (I;JP;In Japanese)
Survey on econometric analysis of petroleum substitution energy for fiscal 1993, 20:1094 (R;JP;In Japanese)
FUEL SUSPENSIONS
See FUEL SLURRIES
FUELS
See also FOSSIL FUELS
FUEL SLURRIES
NUCLEAR FUELS
WOOD FUELS
Estimating household fuel oil/kerosine, natural gas, and LPG prices by census region, 20:997 (R;US)
FUELS (NUCLEAR)
See NUCLEAR FUELS
FUELWOOD
See WOOD FUELS
FULCRUM OPERATION
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
FULHAM-SIMON-CARVES PROCESS
See DESULFURIZATION
FULLERENES
Aromatics oxidation and soot formation in flames: Progress report, August 15, 1993–June 30, 1994, 20:1420 (R;US)
Dynamic Jahn-Teller-induced infrared absorption of a charged C^-_{60} molecule, 20:2297 (R;XA)
Novel catalysts for methane activation: Quarterly report No. 3, April 1, 1993–June 30, 1993, 20:631 (R;US)
Novel catalysts for methane activation: Quarterly report No. 7, April 1, 1994–June 30, 1994, 20:632 (R;US)
Photoinduced charge transfer between fullerenes and TiO_2 semiconductor colloids, 20:1373 (R;US)
Structural and electronic properties of $C_6 0H_{36}$, 20:1263 (IA;AU)
FUMES
See AEROSOLS
FUNDAMENTAL PARTICLES
See ELEMENTARY PARTICLES
FURANS
See also BENZOFURANS
Formation and degradation mechanisms of polychlorodibenzodioxins, polychlorodibenzofurans and other organic pollutants produced in waste incineration processes: Final report, 20:1346 (I;DE;In German)
FURNACE OIL
See HEATING OILS
FURNACES
See also ELECTRIC FURNACES
GAS FURNACES
OIL FURNACES
Particulate behavior in a controlled-profile pulverized coal-fired reactor: A study of coupled turbulent particle dispersion and thermal radiation transport: Quarterly technical progress report, December 15, 1993–March 14, 1994, 20:89 (R;US)
FUSILEER OPERATION
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
FUSION ENERGY
See THERMONUCLEAR REACTORS
FUSION REACTORS
See THERMONUCLEAR REACTORS
FW-STOIC PROCESS
See COAL GASIFICATION

G

GADOLINIUM
Importance of the use of gadolinium in neurocysticercosis diagnosis, 20:1875 (I;BR;In Portuguese)
GADOLINIUM ALLOYS
The magnetic properties of Gd $(Fe_{1-x}\ Co_x)_9\ Ti_2$ alloys, 20:1134 (IA;AU)
GADOLINIUM COMPLEXES
Influence of hydration of selected gadolinium β-diketonates on their EPR spectra, 20:1354 (IA;PL)

GALLIUM ARSENIDE SOLAR CELLS
GaAs thin film solar cells: Final report, 20:683 (R;DE;In German)
Growth and development of GaInAsP for use in high-efficiency solar cells: Final subcontract report, 1 July 1991–30 December 1993, 20:689 (R;US)
GALLIUM ARSENIDES
Additives
Characterization of inactive carbon in GaAs, 20:1284 (R;US)
Aluminium Compounds
Enhanced spin g-factor and split Landau-level for AlGaAs/GaAs heterostructures in strong magnetic fields, 20:2322 (IA;AU)
Tunneling current in Al_x Ga_{1-x} As/ Al_y Ga_{1-y} As/GaAs double barrier quantum well structures, 20:2393 (IA;AU)
Carbon
Carbon and oxygen analysis in MOCVD grown HgCdMnTe and AlGaAs by charged particle activation, 20:1313 (IA;AU)
Charged-Particle Activation Analysis
Carbon and oxygen analysis in MOCVD grown HgCdMnTe and AlGaAs by charged particle activation, 20:1313 (IA;AU)
Charged-Particle Transport
Monte Carlo study of electron-plasmon scattering effects on hot electron transport in GaAs, 20:2343 (R;XA)
Electric Bridges
Contact anomalies in the integral quantum Hall Effect, 20:1273 (IA;AU)
Electric Conductivity
Plasma-induced-damage of GaAs during etching of refractory metal contacts, 20:1287 (R;US)
Electric Contacts
Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures, 20:1137 (IA;AU)
Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs, 20:1507 (R;US)
Electron Gas
The freezing of 2D electron liquid in a random potential, 20:1129 (IA;AU)
Electron-Phonon Coupling
Edge phonoconductivity in a magnetically quantised two-dimensional electron gas, 20:1128 (IA;AU)
Gyromagnetic Ratio
Enhanced spin g-factor and split Landau-level for AlGaAs/GaAs heterostructures in strong magnetic fields, 20:2322 (IA;AU)
Internal Friction
Temperature dependence of displacement module and internal friction in Ga As monocrystals., 20:1142 (IA;UA;In Russian)
Oxygen
Carbon and oxygen analysis in MOCVD grown HgCdMnTe and AlGaAs by charged particle activation, 20:1313 (IA;AU)
Phonons
Resonant generation of nonequilibrium phonons in GaAs/AlAs quantum wells via intersubband scattering, 20:2306 (R;US)
Photoelectron Spectroscopy
High energy photoelectron diffraction data from GaAs surfaces, 20:2321 (IA;AU)
Photoemission
GaAs conduction bands observed by inverse photoemission spectroscopy, 20:2302 (IA;AU)
Photoionization
Photoionization of shallow donor impurities in finite-barrier quantum wells, 20:2283 (R;XA)
Shear Properties
Temperature dependence of displacement module and internal friction in Ga As monocrystals., 20:1142 (IA;UA;In Russian)
Sorptive Properties
Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies, 20:1375 (R;US)
Thin Films
Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures, 20:1137 (IA;AU)
Tunnel Effect
Tunneling current in Al_x Ga_{1-x} As/ Al_y Ga_{1-y} As/GaAs double barrier quantum well structures, 20:2393 (IA;AU)
Vacuum States
GaAs conduction bands observed by inverse photoemission spectroscopy, 20:2302 (IA;AU)
GALLIUM PHOSPHIDE SOLAR CELLS
Growth and development of GaInAsP for use in high-efficiency solar cells: Final subcontract report, 1 July 1991–30 December 1993, 20:689 (R;US)
GAMMA DECAY
Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994, 20:2276 (R;US)
GAMMA DOSIMETRY
The applied L-glutamine in gamma and electron dosimetry, 20:1639 (IA;PL)
GAMMA RADIATION
See also PROMPT GAMMA RADIATION
Determination of relative efficiency of a GMX-detector, 20:2224 (R;EG)
Effects of gamma radiation on fruit fly, Dacus zonatus (Saunders), 20:1901 (IA;TH;In Thai)
The effects of gamma irradiation on blood and its components, 20:1899 (IA;TH)
GAMMA SPECTROMETERS
SWEPP gamma-ray spectrometer system software user's guide, 20:258 (R;US)
Studies on a modular high-energy photon spectrometer of pure CsI scintillators, 20:1644 (R;DE;In German)
GAMMA SPECTROSCOPY
The FRAM code: Description and some comparisons with MGA, 20:1331 (R;US)
GAS BURSTS
See ROCK BURSTS
GAS COMPRESSORS
Acceptance test report for 241-AW process air system, 20:375 (R;US)
GAS COOLANTS
See GASES
GAS COOLED REACTORS
See also HTGR TYPE REACTORS
HELIUM COOLED REACTORS
PEBBLE BED REACTORS
Afterheat removal for HTR-10 test module under accident conditions, 20:775 (RA;XA)
Safety criteria and provisions for the evacuation of residual heat from graphite gas cooled reactors, 20:771 (RA;XA)
The ultimate safety of the HTR-Module during hypothetical accidents, 20:773 (RA;XA)
GAS ENGINES
See INTERNAL COMBUSTION ENGINES
GAS FIELDS
See NATURAL GAS FIELDS
GAS FLOW
See also AIR FLOW
Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material, 20:1425 (R;US)
GAS FURNACES
Development and testing of a high efficiency advanced coal combustor: Phase III Industrial boiler retrofit: Quarterly technical progress report number 10, January 1–March 31, 1994, 20:88 (R;US)
Fuzzy modelling of a gas furnace, 20:1494 (I;DE;In German)
GAS GENERATORS
Scale-up of mild gasification to a process development unit: Quarterly report, February–May, 1994, 20:11 (R;US)
GAS LASERS
See also CARBON DIOXIDE LASERS
Applications for reactor-pumped lasers, 20:1508 (R;US)
GAS TURBINE ENGINES
Toughened Silcomp composites for gas turbine engine applications: Continuous fiber ceramic composites program: Phase I final report, April 1992–June 1994, 20:1063 (R;US)
GAS TURBINE POWER PLANTS
Fossil fuel conversion–measurement and modeling, 20:729 (R;US)

Helium turbomachine design for GT-MHR power plant, 20:770 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines (moving bed, fluid bed contactor/ceramic filter): Twenty-seventh quarterly status report, April–June 1994, 20:10 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines: Twenty-sixth quarterly report: Quarterly status for the period January–March 1994, 20:9 (R;US)

GAS TURBINES
See also COAL-FIRED GAS TURBINES
Advanced gas turbine systems research: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:727 (R;US)

GAS UTILITIES
Annual report 1993 of the German Gas and Water Supply Association (DVGW), 20:983 (I;DE;In German)

GAS WELLS
See NATURAL GAS WELLS

GASEOUS EFFLUENTS
See GASEOUS WASTES

GASEOUS WASTES
See also EXHAUST GASES
FLUE GAS
Ceramem filters for removal of particles from hot gas streams, 20:60 (R;US)
Characterization of void volume VOC concentration in vented TRU waste drums - an interim report, 20:261 (R;US)
Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994), 20:308 (R;US)

GASES
See also COAL GAS
COSMIC GASES
DISSOLVED GASES
ELECTRON GAS
EXHAUST GASES
FERMI GAS
FUEL GAS
RARE GASES
SYNTHESIS GAS
CHEMKIN2: General Gas-Phase Chemical Kinetics, 20:2538 (CM;US)
Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)

GASOLINE
Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1, 20:478 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 23: Quarterly technical progress report for third quarter fiscal year 1992 (April 1–June 30, 1992), 20:27 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992), 20:26 (R;US)

GASOLINE ENGINES
See INTERNAL COMBUSTION ENGINES

GASTEROPODS
See MOLLUSCS

GELATION
Development of a rapid gelation apparatus with microwave heating, 20:818 (R;JP;In Japanese)

GELS
Improved techniques for fluid diversion in oil recovery: Quarterly technical progress report, July 1, 1994–September 30, 1994, 20:114 (R;US)

GENERAL CIRCULATION MODELS
Diagnosis of balanced and unbalanced motions in a synoptic-scale baroclinic wave life cycle, 20:1716 (RA;US)
Hydrologic and radiative feedbacks on extratropical transient eddies: Implications of global warming, 20:1720 (RA;US)
Predictability of blocking, 20:1738 (RA;US)
Stochastic excitation of low frequency variability in the midlatitude atmosphere, 20:1723 (RA;US)
Transient and stationary eddies in differing GCM climates, 20:1721 (RA;US)
Transient eddies and low frequency variability in the Northern Hemisphere winter climates of two GCMs, 20:1722 (RA;US)

GENERAL RELATIVITY THEORY
See also RELATIVITY THEORY
Wormhole on the Lobachevsky background, 20:1976 (R;XJ)

GENERATORS (ELECTRIC)
See ELECTRIC GENERATORS

GENETIC RADIATION EFFECTS
Radiation physics, biophysics, and radiation biology: Progress report, December 1, 1993–November 30, 1994, 20:1912 (R;US)

GENOTYPE
Construction of an integrated database to support genomic sequence analysis, 20:1864 (R;US)

GEOCHEMICAL SURVEYS
Report on joint ecogeochemical mapping and monitoring in the West Murmansk Region and the contiguous areas of Finland and Norway, 20:1823 (R;NO)

GEOLOGIC FAULTS
Direct fault dating trials at the Aespoe Hard Rock Laboratory, 20:1836 (R;SE)
Staff Technical Position on consideration of fault displacement hazards in geologic repository design, 20:292 (R;US)

GEOLOGIC FRACTURES
See also GEOLOGIC FAULTS
Stiffness and strength properties of natural fractures from north ramp drill holes, 20:467 (R;US)
Technological verification of geothermal exploration in 1992.: Development of fractured reservoir exploration and electromagnetic wave-utilizing exploration (development of array CSMT), 20:711 (I;JP;In Japanese)
Validation studies for assessing unsaturated flow and transport through fractured rock, 20:1824 (R;US)

GEOLOGIC SURVEYS
Geological and petrophysical characterization of the Ferron Sandstone for 3-D simulation of a fluvial-deltaic reservoir: Quarterly report, April 1, 1994–June 30, 1994, 20:96 (R;US)

GEOLOGICAL SURVEYS
See GEOLOGIC SURVEYS

GEOPHYSICAL SURVEYS
Technological verification of geothermal exploration in 1992.: Development of fractured reservoir exploration and electromagnetic wave-utilizing exploration (development of array CSMT), 20:711 (I;JP;In Japanese)

GEOTHERMAL AREAS
See GEOTHERMAL FIELDS

GEOTHERMAL ENERGY
Alpine 1/Federal: Executive summary final report, 20:709 (R;US)
Alpine 1/Federal: Temperature gradients, geothermal potential, and geology: Final report, Part 2, 20:710 (R;US)

GEOTHERMAL EXPLORATION
Survey report on geothermal energy development and the environment (landscape). 2, 20:715 (R;JP;In Japanese)

GEOTHERMAL FIELDS
Microearthquake monitoring and seismic imaging at The Geysers, 20:713 (R;US)
Tensor controlled-source audiomagnetotelluric survey over the Sulphur Springs Thermal area, Valles Caldera, New Mexico, U.S.A.; Implication for structure of the western Caldera and for CSAMT methodology, 20:1779 (R;US)

GEOTHERMAL HEATING SYSTEMS
Geothermal direct-heat utilization assistance: Quarterly project progress report, July 1994–September 1994, 20:716 (R;US)

GEOTHERMAL POWER PLANTS
Survey report on geothermal energy development and the environment (landscape). 2, 20:715 (R;JP;In Japanese)

GEOTHERMAL REGIONS
See GEOTHERMAL FIELDS

GEOTHERMAL RESOURCES
Geothermal direct-heat utilization assistance: Quarterly project progress report, July 1994–September 1994, 20:716 (R;US)
Newberry Geothermal Pilot Project, 20:714 (R;US)

GERMAN DEMOCRATIC REPUBLIC
See FEDERAL REPUBLIC OF GERMANY
GERMAN DR ORGANIZATIONS
See GERMAN FR ORGANIZATIONS
GERMAN FEDERAL REPUBLIC
See FEDERAL REPUBLIC OF GERMANY
GERMAN FR ORGANIZATIONS
See also ZFK ROSSENDORF
Hahn-Meitner-Institut Berlin. Annual report 1993, 20:2463 (R;DE;In German)
Institute for Petroleum Research. Annual report 1991, 20:94 (I;DE;In German)
Technology for the future, 20:2452 (I;DE;In German)
GERMANIDES
Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs, 20:1507 (R;US)
GERMANIUM
Zeeman Effect of the shallow acceptors Boron, Gallium and Thallium in Germanium at magnetic fields up to 7 T, 20:2285 (IA;AU)
GERMANY
See FEDERAL REPUBLIC OF GERMANY
GERMANY (DEMOCRATIC REPUBLIC)
See FEDERAL REPUBLIC OF GERMANY
GERMANY (FEDERAL REPUBLIC)
See FEDERAL REPUBLIC OF GERMANY
GERMS (MICROORGANISMS)
See MICROORGANISMS
GIANT RESONANCE
(γ, n) cross section in heavy nuclei in the region of the giant quadrupole resonance, 20:2264 (R;XJ;In Russian)
The giant dipole resonance built on highly excited states: Results of the MEDEA experiment, 20:2209 (R;FR)
GLASS
See also BOROSILICATE GLASS
Determination of thin film optical constants using variable angle reflectance, 20:1275 (IA;AU)
Effects of glass surface area-to-solution volume ratio (S/V) on glass dissolution: Part one: Relationship between S/V and leachate pH, 20:217 (R;US)
Glass science tutorial: Lecture #1, Chemistry and properties of oxide glasses, 20:1290 (R;US)
Glass science tutorial: Lecture #2, Operating electric glass melters, 20:331 (R;US)
Multilayer thin film colour selective filters, 20:1276 (IA;AU)
The numerical integration and 3-D finite element formulation of a viscoelastic model of glass, 20:1288 (R;US)
GLIOMAS
Tomographic criteria of gliomas in the brain stem in infants, 20:1877 (I;BR;In Portuguese)
GLOBAL CLIMATE CHANGE
See CLIMATIC CHANGE
GLOBAL WARMING
See GREENHOUSE EFFECT
GLOVEBOXES
A modular dexterous robot for glove box applications, 20:1461 (R;US)
GLOVES
Electrical-conductivity testing of latex gloves, 20:1487 (R;US)
GLYCIDES
See SACCHARIDES
GOBAR GAS
See METHANE
GOLD
Angular and charge state distributions of highly charged ions scattered during low energy surface-channeling interactions with Au(110), 20:2347 (R;US)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)
Surface x-ray scattering and scanning tunneling microscopy studies at the Au(111) electrode, 20:2309 (R;US)
GOLD 197 REACTIONS
Flow and multifragmentation in nuclear collisions at intermediate energies, 20:2271 (R;US)
Fragment flow and the multifragmentation phase space, 20:2239 (R;DE)
GOLD 197 TARGET
Flow and multifragmentation in nuclear collisions at intermediate energies, 20:2271 (R;US)
Fragment flow and the multifragmentation phase space, 20:2239 (R;DE)
Neutron removal in peripheral relativistic heavy ion collisions, 20:2240 (R;DE)
GRADED LIE GROUPS
Quantum Hamiltonian reduction in superspace formalism, 20:2063 (R;FR)
GRAIN ALCOHOL
See ETHANOL
GRAMINEAE
Perennial grass production for biofuels: Soil conversion considerations, 20:630 (R;US)
GRAND UNIFIED THEORY
Bound on the lightest Higgs mass in the minimal ηmodel at one loop, 20:2188 (RA;DE)
Detecting the non-minimal supersymmetric Higgs boson at the NLC, 20:2187 (RA;DE)
Invisibly decaying Higgs boson at e^+e^- collisions, 20:2105 (RA;DE)
On a possible explanation of the origin of the quark mass spectrum, 20:2098 (R;XJ)
Radiative corrections to $e^+e^- \rightarrow \mu^+\mu^-$ and the top decay $t \rightarrow bW$ in the Two Higgs doublet model, 20:2108 (RA;DE)
Radiative corrections to leptoquark pair production in e^+e^- annihilation, 20:2135 (RA;DE)
Search for neutral particles in nonminimal SUSY model, 20:2189 (RA;DE)
Single production of new leptons, 20:2134 (RA;DE)
Ten dimensional SO(10) G.U.T. models with dynamical symmetry breaking, 20:2066 (R;AU)
The BESS model at e^+e^- colliders, 20:2132 (RA;DE)
GRANULAR MATERIALS
A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994, 20:78 (R;US)
GRAPHITE
(e, 2e) measurements of thin graphite film, 20:1255 (IA;AU)
Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)
In-situ control of solids oxidation, 20:2329 (IA;AU)
Tight binding calculations of the surface electronic DOS of graphite, 20:2304 (IA;AU)
GRAPHITE MODERATOR
See GRAPHITE
GRASS
See GRAMINEAE
GRAVICHEM PROCESS
See DESULFURIZATION
GRAVITATION
Boundary dynamics in dilaton gravity, 20:2043 (R;XA)
Geometric gauge fields in semiclassical gravity, 20:2042 (R;XA)
GRAVITY WAVES
On fractal structure of quantum gravity and relic radiation anisotropy, 20:2057 (R;XJ)
Potential vorticity dynamics in the Canadian Climate Centre GCM, 20:1725 (RA;US)
GRAY
See RADIATION DOSE UNITS
GREASES
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)
GREAT BRITAIN
See UNITED KINGDOM
GREAT LAKES REGION
See USA
GREAT PLAINS
See USA

GREELEY EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

GREENHOUSE EFFECT
Budgets and balances in a warmer world, 20:1710 (RA;US)
CO_2 burden and climatic risk: Strategies of action of the German electricity supply companies, 20:920 (I;DE;In German)
Do we need a tax on energy or CO_2?, 20:919 (I;DE;In German)

GREENHOUSE GASES
A report on workshops: General circulation model study of climate- chemistry interaction, 20:1709 (R;US)
Emissions of greenhouse gases in the United States: 1987–1992, 20:1705 (R;US)
Identification and analysis of data sources for data bases on greenhouse gas emissions in Germany not resulting from energy conversion processes: Study within IKARUS project, sub-project 9, 20:1760 (R;DE;In German)

GREENHOUSES
Utilization of solar energy for energy autonomous climatisation and irrigation of greenhouses in hot arid zones: Final report, 20:1045 (I;DE;In German)

GREENLAND
Potentials for hydroelectricity close to urban areas in Greenland, 20:635 (R;DK;In Danish)

GRILLO PROCESS
See DESULFURIZATION

GROSS-NEVEU MODEL
See LAGRANGIAN FIELD THEORY

GROUND WATER
Chemical Composition
Alligator Rivers Analogue project. Groundwater Chemistry: Final Report - Volume 7, 20:1802 (I;AU)

Contamination
Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
Baseline risk assessment of ground water contamination at the Monument Valley Uranium Mill Tailings Site, Cane Valley, Arizona: Revision 1, 20:228 (R;US)
Baseline risk assessment of ground water contamination at the inactive uraniferous lignite ashing site near Belfield, North Dakota, 20:488 (R;US)
Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91, 20:451 (R;US)
Concentrations of dissolved radon-222 in water from selected wells and springs in Idaho, 1989-91, 20:1784 (R;US)
Descriptions of representative contaminated sites and facilities within the DOE complex, 20:511 (R;US)
Eielson Air Force Base operable unit 2 and other areas record of decision, 20:1829 (R;US)
Fundamental quantitative analysis of microbial activity in aquifer bioreclamation, 20:1780 (R;US)
Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994, 20:339 (R;US)
Groundwater remediation at UMTRA Sites, 20:485 (RA;US)
Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)
H-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:441 (R;US)
H-area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:432 (R;US)
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report – Fourth quarter 1993 and 1993 summary: Volume 2, 20:474 (R;US)
Mercury migration into ground water, a literature study, 20:1778 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994, 20:475 (R;US)
P-Area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:434 (R;US)
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)
Research of documents pertaining to waste migration from leaking single-shell tanks, 20:472 (R;US)
Shallow groundwater investigations at Weldon Spring, Missouri: Final report for fiscal years 1988-1990, 20:1791 (R;US)
Site environmental report: 1993, 20:501 (R;US)
Site-specific standard request for Underground Storage Tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility Buildings 9754-1 and 9720-15, 20:545 (R;US)
Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system, 20:307 (R;US)
Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
UMTRA Project water sampling and analysis plan, Belfield and Bowman, North Dakota, 20:489 (R;US)
Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas, 20:1495 (R;US)
Use of engineered soils and other site modifications for low-level radioactive waste disposal, 20:1786 (R;US)
Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)

Flow Models
Hydrologic budget for A/M Area, Savannah River Site, 20:477 (R;US)

Fluid Flow
Hydrogeology along the southern boundary of the Hanford Site between the Yakima and Columbia Rivers, Washington, 20:1830 (R;US)
Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures, 20:288 (R;US)

Geochemistry
Geochemical modelling of the groundwater at the Olkiluoto site, 20:1861 (R;FI)

Hydrology
Shallow groundwater investigations at Weldon Spring, Missouri: Final report for fiscal years 1988-1990, 20:1791 (R;US)

Isotope Ratio
Alligator Rivers Analogue project. Groundwater Chemistry: Final Report - Volume 7, 20:1802 (I;AU)

Monitoring
Designing an enhanced groundwater sample collection system, 20:1831 (R;US)
Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994, 20:339 (R;US)
H-Area, K-Area, and Par Pond Sewage Sludge Application Sites groundwater monitoring report: Second quarter 1994, 20:439 (R;US)
H-area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:432 (R;US)
K-Area acid/caustic basin groundwater monitoring report: First quarter 1994, 20:433 (R;US)
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
P-Area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:434 (R;US)
Remedial investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the

Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendixes, 20:495 (R;US)
Shallow groundwater investigations at Weldon Spring, Missouri: Final report for fiscal years 1988-1990, 20:1791 (R;US)
Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
Work plan for ground water elevation data recorder/monitor well injection at Grand Junction, Colorado, 20:490 (R;US)
Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado: Revision 1, 20:492 (R;US)
Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado, 20:491 (R;US)

Radioactivation
Activation concentrations outside the SSC accelerator enclosures, 20:1598 (R;US)

Radiochemical Analysis
F-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:440 (R;US)

Radionuclide Migration
Benchmarking of computer codes and approaches for modeling exposure scenarios, 20:239 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 2, 20:1691 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)

Remedial Action
Accelerated clean-up at the Hanford Site, 20:520 (R;US)
Baseline risk assessment of ground water contamination at the Monument Valley Uranium Mill Tailings Site, Cane Valley, Arizona: Revision 1, 20:228 (R;US)
Field demonstration of rapid turnaround, multilevel groundwater screening, 20:1821 (R;US)
Fundamental quantitative analysis of microbial activity in aquifer bioreclamation, 20:1780 (R;US)
Shallow groundwater investigations at Weldon Spring, Missouri: Final report for fiscal years 1988-1990, 20:1791 (R;US)
Sour gas plant subsurface remediation technology research and demonstration project: Quarterly technical progress report, January 1, 1994–March 31, 1994, 20:139 (R;US)
UMTRA Project water sampling and analysis plan, Belfield and Bowman, North Dakota, 20:489 (R;US)
Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas, 20:1495 (R;US)

Sampling
Designing an enhanced groundwater sample collection system, 20:1831 (R;US)
Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:506 (R;US)

Solvent Properties
Thermodynamic modeling of neptunium(V) solubility in concentrated $Na\text{-}CO_3\text{-}HCO_3\text{-}Cl\text{-}ClO_4\text{-}H\text{-}OH\text{-}H_2O$ systems, 20:315 (R;US)

Water Pollution Control
Groundwater remediation at UMTRA Sites, 20:485 (RA;US)
Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)
Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
Use of engineered soils and other site modifications for low-level radioactive waste disposal, 20:1786 (R;US)

Water Quality
Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1, 20:478 (R;US)
Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:462 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:464 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:461 (R;US)
Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:463 (R;US)
Hanford Site ground-water monitoring for 1993, 20:466 (R;US)
Quarterly report of RCRA groundwater monitoring data for period April 1 through June 30, 1994, 20:455 (R;US)
Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:465 (R;US)
The Savannah River Site's groundwater monitoring program: First quarter 1994, 20:458 (R;US)

GROUND-WATER RESERVES
See AQUIFERS

GROUTING
Impact characteristics of energy absorbing materials for radioactive material transport packages, 20:1250 (IA;JP)

GROWTH (CRYSTAL)
See CRYSTAL GROWTH

GUNS
Gunfire characterization and simulation using temporal moments, 20:1684 (R;US)

GYROTRONS
See MICROWAVE AMPLIFIERS

H

HAAG-ARAKI FIELD THEORY
See ALGEBRAIC FIELD THEORY

HADRONIC CLUSTERS
See CLUSTER EMISSION MODEL

HADRONS
Hadronization in nuclear matter, 20:2243 (R;FR)
Heavy quark effective theory, interpolating fields and Bethe-Salpeter amplitudes, 20:2084 (R;XA)
Source dimensions in ultrarelativistic heavy ion collisions, 20:2235 (R;US)

HAFNIUM 178 TARGET
Blocking effect in the $16^+ \rightarrow 16^+$ (p,t) transition on the isomeric $^{178}Hf^{m2}$ target, 20:2244 (R;FR)

HAINES PROCESS
See DESULFURIZATION

HALFBEAK EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

HALOGENATED ALIPHATIC HYDROCARBONS
See also CHLORINATED ALIPHATIC HYDROCARBONS
Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)

HAMILTON OPERATORS
See HAMILTONIANS

HAMILTONIANS
Nonlinearity induced nontrivial dynamics in the Jaynes-Cummings Hamiltonian, 20:1985 (R;XA)
On the numerical method for analysis of the dynamics of the classical Hamiltonian systems, 20:2543 (R;XJ)
Quantization of a Hamiltonian system with an infinite number of degrees of freedom, 20:2058 (R;XJ)

HAMSTERS
Inhibition of mitotic-specific histone phophorylation by sodium arsenite, 20:1967 (R;US)

HANDCAR EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

HANDLEY EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

HANDLING (DATA)
See DATA PROCESSING

HANDLING (WASTES)
See WASTE MANAGEMENT

HANFORD ENGINEERING DEVELOPMENT LABORATORY
Financial services FY 1995 site support program plan WBS 6.10.4, 20:2518 (R;US)

Special initiatives FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 5.0, 20:938 (R;US)

HANFORD PRODUCTION REACTORS
Plutonium and tritium produced in the Hanford Site production reactors, 20:563 (R;US)
Progress report on O2 research and development Mission 14: Columbia River studies, July–December 1966, 20:834 (R;US)
Revised variable goal exposure plans for C-II-N and C-II-E material, 20:856 (R;US)
Safety assessment of discharge chute isolation barrier preparation and installation: Revision 1, 20:526 (R;US)
Technical Division weekly progress report for period ending June 5, 1943, 20:867 (R;US)
Technical Division weekly progress report for period ending May 22, 1943, 20:866 (R;US)
The history and legacy of Project X, 20:522 (R;US)
The low pressure critical flow behavior of steam-water mixtures in constant area flow passages, 20:857 (R;US)
[Technical progress report for Hanford 100 and 300 areas]: Progress report ending May 15, 1943, 20:865 (R;US)

HANFORD RESERVATION
Administrative Procedures
Operability test report for the 300 Area Treated Effluent Disposal Facility, 20:343 (R;US)
Building Codes
Radiological design guide, 20:1455 (R;US)
Buildings
Load test of the 272E Building high bay roof deck and support structure, 20:523 (R;US)
Electric Utilities
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2521 (R;US)
Environmental Effects
Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)
New distribution records and notes on the life history and behavior of the sand roller, Percopsis transmontana (Eigenmann and Eigenmann), 20:835 (R;US)
Environmental Impacts
Factors affecting the quality of fish caught by Native Americans in the Zone 6 fishery 1991 through 1993, 20:1858 (R;US)
Fire Fighting
Fire protection program fiscal year 1995 site support program plan, Hanford Fire Department, 20:535 (R;US)
Fuel Fabrication Plants
308 Building electrical load list and panel schedules, 20:886 (R;US)
Fuel Pools
The history and legacy of Project X, 20:522 (R;US)
Fuel Reprocessing Plants
308 Building electrical load list and panel schedules, 20:886 (R;US)
Sludge Stabilization Campaign blend plan, 20:338 (R;US)
Fuel Storage Pools
MBA acceptance test procedures, software Version 1.4, 20:566 (R;US)
Hydrology
Hydrogeology along the southern boundary of the Hanford Site between the Yakima and Columbia Rivers, Washington, 20:1830 (R;US)
Laboratories
Analytical services FY 1995 multi-year program plan fiscal year work plan, WBS 1.5.1, 20:214 (R;US)
LABCORE post release 1.0 development system project management plan, 20:406 (R;US)
Low-level waste certification plan for the WSCF Laboratory Complex, 20:335 (R;US)
Low-level waste characterization plan for the WSCF Laboratory Complex, 20:336 (R;US)
Waste management plan for Hanford spent nuclear fuel characterization activities, 20:348 (R;US)
Maintenance
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2521 (R;US)
Management
Hanford Site National Environmental Policy Act (NEPA) characterization: Revision 6, 20:579 (R;US)
Material Balance
Cleanup MAC and MBA code ATP, 20:2566 (R;US)
Nuclear Facilities
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
Nuclear Materials Management
Conversion to Paradox 4.02 ATP's for MAC and mass balance programs, 20:564 (R;US)
Security Transition Program Office (STPO), technology transfer of the STPO process, tools, and techniques, 20:549 (R;US)
Occupational Safety
Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)
Operation
200 Area monthly report, July 1966, 20:158 (R;US)
Pollution Abatement
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
Program Management
Budget FY 1995 site support program plan WBS 6.10.1, 20:2519 (R;US)
Planning integration FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP), 20:213 (R;US)
Project L-070, "300 Area process sewer piping system upgrade" Project Management Plan, 20:1771 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2521 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2520 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2522 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:537 (R;US)
Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
Transition projects FY 1995 multi-year program/fiscal year work plan WBS 1.3.1. and 7.1, 20:538 (R;US)
Work management administration FY 1995 site support program plan WBS 6.2, 20:2523 (R;US)
Radiation Monitoring
Radiological control FY 1995 site support program plan WBS 6.7.2.4, 20:536 (R;US)
Radiation Protection
Hanford Generic Interim Safety Basis, 20:341 (R;US)
Radioactive Waste Disposal
A quality control program for waste disposal vault closure, 20:334 (R;US)
Radioactive Waste Facilities
242-A Evaporator/Liquid Effluent Retention Facility data quality objectives, 20:383 (R;US)
95-1 Campaign evaporator boildown results, 20:382 (R;US)
Acceptance test procedure for Project W-049H, 20:357 (R;US)
Aerosol can puncture device operational test plan, 20:356 (R;US)
B Plant cleanout and stabilization program update, 20:532 (R;US)
B Plant: WESF location study, 20:530 (R;US)
Engineering task plan for steam line ramp calculations, 20:399 (R;US)
Geologic setting of the low-level burial grounds, 20:340 (R;US)
Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method, 20:509 (R;US)
Phase III (full scale) agitated mixing test plan, 20:363 (R;US)
Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1, 20:353 (R;US)

Test plan for core sampling drill bit temperature monitor, 20:534 (R;US)
WRAP 2A advanced conceptual design report comments, 20:359 (R;US)
Waste Receiving and Packaging, Module 2A, Supplemental Design Requirements Document, 20:360 (R;US)

Radioactive Waste Management
1994 Solid waste forecast summary: Waste characteristics and treatability groups, 20:327 (R;US)
241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:369 (R;US)
241-AV/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:371 (R;US)
242-A Evaporator waste analysis plan: Revision 4, 20:401 (R;US)
B Plant retired HEPA filters engineering study (Project W-059), 20:358 (R;US)
Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Critically safety evaluation for K Basins sandfilters, 20:344 (R;US)
Data quality objectives process applied to characterization of Hanford tanks containing ferrocyanide, 20:310 (R;US)
Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1), 20:402 (R;US)
Hanford Generic Interim Safety Basis, 20:341 (R;US)
Low level tank waste disposal study, 20:368 (R;US)
Quality assurance program plan for low-level waste at the WSCF Laboratory, 20:337 (R;US)
Radiological implications of contact maintenance: Impacts on facility design, 20:415 (R;US)
Reduction of nitrate and nitrite salts under hydrothermal conditions, 20:290 (R;US)
Solid waste management complex site development plan, 20:364 (R;US)
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)
Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)
Tank characterization report for double-shell Tank 241-AW-102, 20:394 (R;US)
Tank characterization report for double-shell Tank 241-AW-105, 20:395 (R;US)
Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994), 20:308 (R;US)
Waste management plan for Hanford spent nuclear fuel characterization activities, 20:348 (R;US)
Waste sampling and characterization facility (WSCF), 20:427 (R;US)

Radioactive Waste Processing
242-A Campaign 94-1 post run document, 20:404 (R;US)
Anti-foam System design description, 20:412 (R;US)
Significant volume reduction of tank waste by selective crystallization: 1994 Annual report, 20:416 (R;US)

Radioactive Waste Storage
241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1, 20:370 (R;US)
B Plant low level waste system integrity assessment plan, 20:425 (R;US)
CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground, 20:351 (R;US)
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
Corrosion assessment of dry fuel storage containers, 20:869 (R;US)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout, 20:329 (R;US)
Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II, 20:326 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)
Geologic setting of the low-level burial grounds, 20:340 (R;US)
Hazard assessments of double-shell flammable gas tanks, 20:533 (R;US)
Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)
Structural analysis of color video camera installation on tank 241AW101 (2 Volumes), 20:380 (R;US)
Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)
Supporting document for the historical tank content estimate for A Tank Farm, 20:385 (R;US)
Supporting document for the historical tank content estimate for B Tank Farm, 20:387 (R;US)
Supporting document for the historical tank content estimate for BY Tank Farm, 20:389 (R;US)
Supporting document for the historical tank content estimate for S tank farm, 20:391 (R;US)
Tank 241-C-103 tank characterization plan, 20:421 (R;US)
Tank Monitor and Control System sensor acceptance test procedure: Revision 5, 20:372 (R;US)
Tank characterization reference guide, 20:418 (R;US)
Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)
Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)
Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)
Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)

Radioactivity
Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site, 20:469 (R;US)

Remedial Action
A team leadership approach to managing the transition from construction to operations for an environmental project, 20:521 (R;US)
Accelerated clean-up at the Hanford Site, 20:520 (R;US)
Advances in technology transfer at Federal Facilities, 20:937 (R;US)
Combining innovative technology demonstrations with dense nonaqueous phase liquids cleanup, 20:1843 (R;US)
Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)

Security
Security Transition Program Office (STPO), technology transfer of the STPO process, tools, and techniques, 20:549 (R;US)
Security Transition Program Office; progress report, 20:548 (R;US)

Site Characterization
Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site, 20:469 (R;US)
Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system, 20:307 (R;US)
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)

Spent Fuel Storage
Paradox applications integration ATP's for MAC and mass balance programs, 20:565 (R;US)
The history and legacy of Project X, 20:522 (R;US)

Storage Facilities
1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan, 20:297 (R;US)

241-SY-101 air lance removal lessons learned, 20:531 (R;US)
616 Nonradioactive Dangerous Waste Storage Facility – Essential/support drawing list: Revision 2, 20:414 (R;US)
Acceptance test report for 241-AW process air system, 20:375 (R;US)
Clean Salt integrated flowsheet, 20:384 (R;US)
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
Engineering drawing field verification program: Revision 3, 20:423 (R;US)
Enhanced sludge washing evaluation plan, 20:328 (R;US)
Feasibility study of tank leakage mitigation using subsurface barriers, 20:529 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)
Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)
In situ sampling device development engineering task plan, 20:398 (R;US)
Interim data quality objectives for waste pretreatment and vitrification: Revision 1, 20:528 (R;US)
Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility, 20:365 (R;US)
Software quality assurance plan for viscometer, 20:407 (R;US)
Software quality assurance plan for void fraction instrument, 20:408 (R;US)
Tank characterization reference guide, 20:418 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)

Tanks
Analytical characterization of high-level mixed wastes using multiple sample preparation treatments, 20:1333 (R;US)
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)

Technology Transfer
Advances in technology transfer at Federal Facilities, 20:937 (R;US)
Hanford technology integration: A success story, 20:933 (R;US)

Transportation Systems
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2522 (R;US)

Waste Management
1993 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site, 20:247 (R;US)
300 Area treated effluent disposal facility operating specifications document, 20:1860 (R;US)
Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
Liquid effluent/Hanford Environmental compliance FY 1995 Multi-Year Program Plan/Fiscal Year Work Plan, WBS 1.2.2.1 and 1.2.2.2, 20:428 (R;US)
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2522 (R;US)

Water Pollution
Research of documents pertaining to waste migration from leaking single-shell tanks, 20:472 (R;US)

Water Pollution Control
Manipulation of natural subsurface processes: Field research and validation: Interim report, 20:510 (R;US)

Water Quality
Hanford Site ground-water monitoring for 1993, 20:466 (R;US)
Quarterly report of RCRA groundwater monitoring data for period April 1 through June 30, 1994, 20:455 (R;US)

Water Utilities
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2521 (R;US)

HARMONIC OSCILLATORS
Ellipsoidal basis for isotropic oscillator, 20:2000 (R;XJ)
On connection of q-deformed para oscillators with para oscillators, 20:1988 (R;XA)

HARRY EVENT
See NUCLEAR EXPLOSIONS

HASTELLOY C-276
See HASTELLOYS

HASTELLOY C-4
See HASTELLOYS

HASTELLOYS
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)

HAZARDOUS MATERIALS
See also TOXIC MATERIALS

Biodegradation
Fundamental quantitative analysis of microbial activity in aquifer bioreclamation, 20:1780 (R;US)

Biological Effects
U.S. Fish and Wildlife Service lands biomonitoring operations manual, 20:1793 (R;US)

Chemical Analysis
242-A Evaporator waste analysis plan: Revision 4, 20:401 (R;US)

Detonations
Nitrate analysis of snow and ice core samples collected in the vicinity of a waste detonation event, McMurdo Station, Antarctica, 20:1792 (R;US)

Environmental Effects
Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes, 20:494 (R;US)

Environmental Transport
U.S. Fish and Wildlife Service lands biomonitoring operations manual, 20:1793 (R;US)

Liquid Wastes
Liquid effluent/Hanford Environmental compliance FY 1995 Multi-Year Program Plan/Fiscal Year Work Plan, WBS 1.2.2.1 and 1.2.2.2, 20:428 (R;US)

Oxidation
Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)

Pollution Abatement
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)

Pollution Sources
Source evaluation report phase 2 investigation: Limited field investigation: Final report: United States Air Force Environmental Restoration Program, Eielson Air Force Base, Alaska, 20:1828 (R;US)

Radioactive Waste Disposal
Proposed waste form performance criteria and testing methods for low-level mixed waste, 20:240 (R;US)

Remedial Action
Methodologies for estimating one-time hazardous waste generation for capacity generation for capacity assurance planning, 20:1826 (R;US)

Removal
Characterization of hazardous constituents in HLW supernate and implications for solid LLW generation, 20:437 (R;US)

Sampling
Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department, 20:294 (R;US)

Screening
Characterization of hazardous constituents in HLW supernate and implications for solid LLW generation, 20:437 (R;US)

Solidification
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)

Method for treating materials for solidification, 20:296 (PA;US)
Testing
Road Transportable Analytical Laboratory (RTAL) System: Quarterly technical report, March 1993–May 1993, 20:1788 (R;US)
Underground Disposal
Addendum to the remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 ponds, boneyard/burnyard, oil landfarm, sanitary landfill I, and the burial grounds, including oil retention ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. main text, 20:242 (R;US)
Underground Storage
Closure certification report for the Bear Creek burial grounds B area and walk-in pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, 20:444 (R;US)
Vitrification
Arc melter demonstration baseline test results, 20:268 (R;US)
Waste Disposal
Methodologies for estimating one-time hazardous waste generation for capacity generation for capacity assurance planning, 20:1826 (R;US)
Nitrate analysis of snow and ice core samples collected in the vicinity of a waste detonation event, McMurdo Station, Antarctica, 20:1792 (R;US)
Waste Management
CERCLA site assessment workbook, Volume 1, 20:233 (R;US)
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
Resource Conservation and Recovery Act (RCRA) contingency plan for hazardous waste treatment, storage, and disposal units at the Oak Ridge Y-12 Plant, 20:546 (R;US)
Waste Storage
Saltcrete formulation, 20:313 (R;US)
HAZEN PROCESS
See DESULFURIZATION
HCDA
See REACTOR CORE DISRUPTION
HD 8077
See NICKEL BASE ALLOYS
HDO
See HEAVY WATER
HE-3 COUNTERS
Performance report for a small package counter that uses active neutron interrogation, 20:559 (R;US)
HEALTH HAZARDS
Implementation plan for engineering research, development and demonstration, 20:1970 (R;US)
Radiation and health, 20:1886 (IA;PL)
HEALTH PHYSICS
See RADIATION PROTECTION
HEAT ENGINES
See also INTERNAL COMBUSTION ENGINES
SOLAR HEAT ENGINES
STIRLING ENGINES
Cost-effective ceramics program in the United States, 20:1173 (R;US)
HEAT EXCHANGERS
High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994, 20:1177 (R;US)
Inhibition of sulfide growth on iron by means of alloying elements and by means of carbon deposition in the gaseous phase: Final report, 20:1117 (R;DE;In German)
The formation of coatings on heat exchanger pipe bundles subjected to transverse flow, 20:1469 (I;DE;In German)
HEAT GAIN
A new method for predicting the solar heat gain of complex fenestration systems: II, Detailed description of the matrix layer calculation, 20:1022 (R;US)
HEAT PIPES
An overview: Component development for solar thermal systems, 20:708 (R;US)
Recent reflux receiver developments under the US DOE program, 20:707 (R;US)
HEAT RESISTING ALLOYS
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Low cycle fatigue at increased temperature under operating conditions, 20:1103 (I;DE;In German)
Numerical description of creep of highly creep resistant alloys, 20:1140 (I;DE;In German)
HEAT SOURCES (RADIOISOTOPE)
See RADIOISOTOPE HEAT SOURCES
HEAT STORAGE DEVICES
See THERMAL ENERGY STORAGE EQUIPMENT
HEAT STORAGE SYSTEMS
See THERMAL ENERGY STORAGE EQUIPMENT
HEAT TRANSFER
See also CONVECTION
THERMAL CONDUCTION
COYOTE II - a finite element computer program for nonlinear heat conduction problems: Part I - theoretical background, 20:1477 (R;US)
DKV joint project: reduction of CFC-emissions in air conditioning and refrigeration. Subproject 6: Pool boiling of new refrigerants and their mixtures at single plain and finned tubes. Final report, 20:1473 (R;DE;In German)
HEAT TRANSMISSION
See HEAT TRANSFER
HEATED EFFLUENTS
See THERMAL EFFLUENTS
HEATER OIL
See HEATING OILS
HEATING OILS
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:127 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending November 11, 1994, 20:972 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
HEATING SYSTEMS
See also GEOTHERMAL HEATING SYSTEMS
SOLAR HEATING SYSTEMS
A self-adjusting combustion control system for low-capacity oil-fired heating systems, 20:1014 (I;DE;In German)
HEAVY ION ACCELERATORS
See also BROOKHAVEN RHIC
On the capabilities of present radioactive beam facilities, 20:1520 (R;FR)
HEAVY ION REACTIONS
See also GOLD 197 REACTIONS
OXYGEN 16 REACTIONS
XENON 129 REACTIONS
Collective flow and particle production in high energy heavy ion collisions, 20:2253 (RA;JP;In Japanese)
Effect of columnar defects on the critical current anisotropy of epitaxial YBa_2 Cu_3 $O_{7-\delta}$ thin films and YBa_2 Cu_3 $O_{7-\delta}$/$PrBa_2$ Cu_3 $O_{7-\delta}$ multilayers, 20:1207 (IA;AU)
Exclusive study of nuclear collisions at the AGS, 20:2272 (R;US)
Neutron removal in peripheral relativistic heavy ion collisions, 20:2240 (R;DE)
New statistical function for the angular distribution of evaporation residues produced by heavy ions, 20:2262 (R;XJ)
QMD calculation of nucleon-nucleus reaction cross sections, 20:2257 (RA;JP)
Rapidity dependence of thermal dileptons resulting from hadronizing quark-gluon matter with finite baryon charge, 20:2238 (R;DE)
Source dimensions in ultrarelativistic heavy ion collisions, 20:2235 (R;US)

Status of intermediate energy nuclear data, 20:2254 (RA;JP)
Stochastic approach in the dynamics of nuclear collisions, 20:2228 (R;FR;In French)
Stopping and two-pion Bose-Einstein correlation results from CERN experiment NA35, 20:2270 (R;US)
The theory of relativistic heavy ion collisions: [Annual] progress report, [July 1, 1993–June 30, 1994], 20:2236 (R;US)

HEAVY ION SPECTROMETERS
A retarding field energy analyser to measure the energy distributions of liquid metal ion sources, 20:1628 (R;DE)
An elastic recoil time of flight spectrometer for material analysis, 20:1637 (IA;AU)
Analysis of compound semiconductor materials using heavy ion recoil spectrometry, 20:2330 (IA;AU)

HEAVY IONS
Perspectives of ion beam utilization on plant gene analysis, 20:1917 (IA;JP;In Japanese)
Study of integrated circuits in natural space environment, 20:1659 (R;FR;In French)

HEAVY LEPTONS
See also TAU NEUTRINOS
TAU PARTICLES
Masses of heavy fermions and Higgs boson in four-generation fermion condensate scheme, 20:2089 (R;XA)
Single production of new leptons, 20:2134 (RA;DE)

HEAVY OILS
See PETROLEUM

HEAVY WATER
Drum investigation committee final report, 20:212 (R;US)

HEAVY WATER COOLANT
See HEAVY WATER

HEAVY WATER MODERATOR
See HEAVY WATER

HEAVY WATER PLANTS
Unknown plant de-construction hazard – Toxic COS and CS_2 gas from torch cutting of pipe, 20:613 (R;US)

HEDTA
Synthetic waste chemical mechanism studies, 20:330 (R;US)

HEISENBERG MODEL
Staggered magnetization in the Heisenberg antiferromagnet, 20:2074 (R;AU)

HELAC
See LINEAR ACCELERATORS

HELIUM
Experimental investigations of electron capture from atomic hydrogen and deuterium by alpha particles: Final report, September 15, 1984–September 14, 1993, 20:2403 (R;US)

HELIUM 3
Few body physics with polarized photons, 20:2234 (R;US)
Quantum prewetting transitions in liquid ^{3}He, 20:2396 (R;FR)

HELIUM 3 REACTIONS
Spectroscopic factors from one-proton stripping reactions on sd-shell nuclei: Experimental measurements and shell model calculations, 20:2245 (R;FR)

HELIUM 4
The surface of liquid ^{4}He at nonzero temperatures, 20:2389 (R;XA)

HELIUM 6
Limits on the window for halo phenomena, 20:2002 (R;FR)
The Realization of the Resonating Group Method Algebraic Version for Three-Cluster Systems., 20:2217 (R;UA)

HELIUM COOLED REACTORS
Helium turbomachine design for GT-MHR power plant, 20:770 (R;US)

HELIUM IONS
Experimental investigations of electron capture from atomic hydrogen and deuterium by alpha particles: Final report, September 15, 1984–September 14, 1993, 20:2403 (R;US)

HELIUM METHOD
See ISOTOPE DATING

HEMATITE
Mechanochemical transformation of hematite to magnetite: structural changes, 20:2318 (IA;AU)

HERA STORAGE RING
Test of internal halo targets in the HERA proton ring, 20:1602 (R;DE)
The proton collimation system of HERA, 20:1601 (R;DE)

HETEROGENEOUS CATALYSIS
Cluster reactions: An approach to understanding the fundamentals of heterogeneous catalysis, 20:1345 (R;US)

HETEROJUNCTIONS
Excitons in semiconducting superlattices, quantum wells, and ternary alloys: Performance report, September 15, 1987–January 31, 1994, 20:1246 (R;US)
Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures, 20:1137 (IA;AU)
Sputter deposition of multilayer thermoelectric films: An approach to the fabrication of two-dimensional quantum wells, 20:1004 (R;US)

HFS
See HYPERFINE STRUCTURE

HIFAR REACTOR
Effects on the surrounding population of postulated major accidents at the AAEC Research Establishment, 20:832 (R;AU)

HIGGS BOSONS
Bound on the lightest Higgs mass in the minimal ηmodel at one loop, 20:2188 (RA;DE)
CP violation in Higgs decays due to Majorana neutrinos, 20:2103 (RA;DE)
Changed Higgs boson discovery potential at a 500 GeV e^+e^- linear collider, 20:2109 (RA;DE)
Detecting the non-minimal supersymmetric Higgs boson at the NLC, 20:2187 (RA;DE)
Higgs boson search at a 500 GeV e^+e^- collider, 20:2176 (R;FR)
Higgs bosons: Intermediate mass range at e^+e^- colliders, 20:2101 (RA;DE)
Invisibly decaying Higgs boson at e^+e^- collisions, 20:2105 (RA;DE)
Masses of heavy fermions and Higgs boson in four-generation fermion condensate scheme, 20:2089 (R;XA)
Perspectives of neutral supersymmetric Higgs boson searches at a 500 GeV e^+e^- linear collider, 20:2106 (RA;DE)
Production of a Higgs with two gauge bosons, 20:2102 (RA;DE)
Radiative corrections in the MSSM Higgs sector: masses and fermionic decays, 20:2186 (RA;DE)
Scalar three body decays and signals for new physics, 20:2159 (R;XA)

HIGGS MODEL
Correlations in Higgs production and decay as a probe of CP-violation in the scalar sector, 20:2104 (RA;DE)
Higgs effects in top production, 20:2126 (RA;DE)
Radiative corrections to $e^+e^-\rightarrow\mu^+\mu^-$ and the top decay $t\rightarrow bW$ in the Two Higgs doublet model, 20:2108 (RA;DE)
Radiative corrections to the supersymmetric Higgs sector, 20:2107 (RA;DE)

HIGH ENERGY PHYSICS
Theoretical particle physics: Progress report, FY 1994, 20:2028 (R;US)
[Experiments at high energy hadron colliders and underground water Cerenkov detector experiment]: Progress report, 20:2029 (R;US)

HIGH ENERGY RADIOTHERAPY
See RADIOTHERAPY

HIGH EXPLOSIVES
See CHEMICAL EXPLOSIVES

HIGH FLUX AUSTRALIAN REACTOR
See HIFAR REACTOR

HIGH FLUX NEUTRON SOURCE FACILITY
See NEUTRON SOURCE FACILITIES

HIGH TEMPERATURE GAS COOLED AND GRAPHITE MODERATED REACTORS
See HTGR TYPE REACTORS

HIGH-LEVEL RADIOACTIVE WASTES
Calcination
Proposed Atomic Energy of Canada Ltd. ^{99}Mo waste calcination process, 20:293 (R;US)

Chemical Analysis
Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm, 20:393 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm, 20:386 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm, 20:390 (R;US)

Chemical Composition
Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification, 20:436 (R;US)
Tank characterization report for double-shell Tank 241-AW-102, 20:394 (R;US)
Tank characterization report for double-shell Tank 241-AW-105, 20:395 (R;US)

Compiled Data
Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm, 20:393 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm, 20:390 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm, 20:386 (R;US)

Configuration
Characteristics of special-case wastes potentially destined for disposal at the Nevada Test Site, 20:316 (R;US)

Data Acquisition
System configuration management plan for 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System, 20:377 (R;US)

Data Analysis
Statistical characterization report for Single-Shell Tank 241-T-107, 20:417 (R;US)

Degassing
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)

Dilution
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)

Heating
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)

Inventories
Characteristics of special-case wastes potentially destined for disposal at the Nevada Test Site, 20:316 (R;US)

Physical Properties
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)

Pilot Plants
Systemic representation of a production system: the Sagace method, 20:222 (R;FR;In French)

Radiation Doses
Determination of the neutron and gamma dose rates and heatings induced by radioactive wastes in repository geological salt formations, 20:221 (R;FR)

Radiation Heating
Determination of the neutron and gamma dose rates and heatings induced by radioactive wastes in repository geological salt formations, 20:221 (R;FR)

Radioactive Waste Disposal
ANL Technical Support Program for DOE Environmental Restoration and Waste Management: Annual report, October 1992–September 1993, 20:216 (R;US)
Determination of the neutron and gamma dose rates and heatings induced by radioactive wastes in repository geological salt formations, 20:221 (R;FR)
Radionuclide release rates from spent fuel for performance assessment modeling, 20:1856 (R;US)
Risk perception on management of nuclear high-level and transuranic waste storage, 20:311 (R;US)
Site characterization progress report: Yucca Mountain, Nevada, October 1, 1993–March 31, 1994, 20:249 (R;US)
Validation studies for assessing unsaturated flow and transport through fractured rock, 20:1824 (R;US)

Radioactive Waste Processing
Clean Salt integrated flowsheet, 20:384 (R;US)
Proposed Atomic Energy of Canada Ltd. ^{99}Mo waste calcination process, 20:293 (R;US)

Radioactive Waste Storage
Characterization of hazardous constituents in HLW supernate and implications for solid LLW generation, 20:437 (R;US)
Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances, 20:332 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report, 20:519 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary, 20:518 (R;US)
Test interference calculations for the Yucca Mountain Project ESF thermomechanical experiments: Yucca Mountain Site Characterization Project, 20:314 (R;US)

Radiochemical Analysis
Analytical characterization of high-level mixed wastes using multiple sample preparation treatments, 20:1333 (R;US)
High level waste characterization in support of low level waste certification: I. HLW supernate radionuclide characterization, 20:435 (R;US)
High level waste tank farm solid waste radionuclide smear sample and analysis plan, 20:438 (R;US)

Radionuclide Migration
Radionuclide release rates from spent fuel for performance assessment modeling, 20:1856 (R;US)
Validation studies for assessing unsaturated flow and transport through fractured rock, 20:1824 (R;US)

Remedial Action
Tank characterization report for Single-Shell Tank T-102, 20:300 (R;US)

Rheology
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)

Sampling
High level waste tank farm solid waste radionuclide smear sample and analysis plan, 20:438 (R;US)
Statistical characterization report for Single-Shell Tank 241-T-107, 20:417 (R;US)
Tank characterization report for Single-Shell Tank 241-T-107, 20:396 (R;US)
Tank characterization report for Single-Shell Tank B-111, 20:299 (R;US)
Tank characterization report for Single-Shell Tank T-102, 20:300 (R;US)

Separation Processes
Enhanced sludge washing evaluation plan, 20:328 (R;US)

Site Selection
Site selection procedure for high level radioactive waste disposal in Bulgaria, 20:279 (I;BG)

Solubility
Radionuclide release rates from spent fuel for performance assessment modeling, 20:1856 (R;US)

Stability
Tank characterization report for Single-Shell Tank 241-T-107, 20:396 (R;US)

Underground Disposal
A large block heater test for high level nuclear waste management, 20:322 (R;US)
Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures, 20:288 (R;US)

Underground Storage
A summary description of the flammable gas tank safety program, 20:411 (R;US)
System configuration management plan for 101-SY Hydrogen Mitigation Test Project Mini-Data Acquisition and Control System of Tank Waste Remediation System, 20:377 (R;US)
Tank Waste Remediation System decisions and risk assessment, 20:325 (R;US)

Vitrification
Systemic representation of a production system: the Sagace method, 20:222 (R;FR;In French)

HIGH-TC SUPERCONDUCTORS
Bismuth Complexes
In-situ X-ray study of freezing and melting of Bi(2212) and Bi(2223), 20:1187 (IA;AU)
Long-length high-Tc superconductor processing, properties and applications, 20:1208 (IA;AU)
Ceramics
Nuclear-physical researches (Theory and experiments). Scientific-technical collection., 20:1222 (I;UA)
Composite Materials
Thermal processes at compacted composite Y Ba_2 Cu_3 O_δ/Ag cooling by liquid nitrogen., 20:1231 (IA;UA;In Russian)
Critical Current
Reactive nanophase oxide additions to melt-processed high-$T_c$superconductors, 20:1168 (R;US)
Variation of properties of the HTSC ceramic doped by silver., 20:1227 (IA;UA;In Russian)
Crystal Defects
Relations between structural and superconducting properties of bulk and thin film high-T_c materials, 20:2386 (R;DK)
Crystal Models
Long-range two-hole bound states in the t-J model, 20:2369 (IA;AU)
Crystal Structure
Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
Depolarization
Anomalous time-decay in neutron depolarization by high-Tc superconductors, 20:2375 (IA;AU)
Electromagnetism
Electromagnetic response of high-Tc thick films, 20:2374 (IA;AU)
Electron Spin Resonance
Electron paramagnetic resonance, magnetic susceptibility and resistance measurements on Mn doped 1:2:3 high temperatures superconductors, 20:2376 (IA;AU)
Electronic Structure
Generation and solution of effective many-body Hamiltonians for rare earth and transition metal compounds, 20:2387 (R;US)
Freezing
Theory of freezing of a flux lattice in high T_c superconductors, 20:2370 (IA;AU)
Fullerenes
How do the oxides and fullerides superconduct?, 20:1268 (IA;AU)
Hysteresis
Josephson behaviour and flux trapping effects in YBCO step edge junctions, 20:2378 (IA;AU)
Josephson Junctions
Josephson behaviour and flux trapping effects in YBCO step edge junctions, 20:2378 (IA;AU)
Magnetic Flux
Anomalous flux pinning by twin boundaries in single-crystalline YBa_2 Cu_3 O_7, 20:2379 (IA;AU)
Anomalous time-decay in neutron depolarization by high-Tc superconductors, 20:2375 (IA;AU)
Reactive nanophase oxide additions to melt-processed high-$T_c$superconductors, 20:1168 (R;US)
Theory of freezing of a flux lattice in high T_c superconductors, 20:2370 (IA;AU)
Magnetic Properties
Magnetic properties of Y 124 and Bi 2212 superconductors, 20:1262 (IA;AU)
Magnetic Susceptibility
Electron paramagnetic resonance, magnetic susceptibility and resistance measurements on Mn doped 1:2:3 high temperatures superconductors, 20:2376 (IA;AU)
Spin gap behaviour of YBa_2 $(Cu_{1-x}$ $Zn_x)_4$ O_8, 20:2377 (IA;AU)
Variation of properties of the HTSC ceramic doped by silver., 20:1227 (IA;UA;In Russian)
Manganese Additions
Electron paramagnetic resonance, magnetic susceptibility and resistance measurements on Mn doped 1:2:3 high temperatures superconductors, 20:2376 (IA;AU)
Microstructure
Nuclear-physical researches (Theory and experiments). Scientific-technical collection., 20:1222 (I;UA)
The defects of high J_c melt textured YBa_2 Cu_3 O_{7-x} superconductors, 20:1194 (IA;AU)
Nuclear Magnetic Resonance
Spin gap behaviour of YBa_2 $(Cu_{1-x}$ $Zn_x)_4$ O_8, 20:2377 (IA;AU)
Oxides
How do the oxides and fullerides superconduct?, 20:1268 (IA;AU)
Particle-Hole Model
The hole-hole superconducting pairing in the t-J model induced by long-range spin-wave exchange, 20:2366 (IA;AU)
Phase Studies
In-situ X-ray study of freezing and melting of Bi(2212) and Bi(2223), 20:1187 (IA;AU)
Quenching
Quench recovery processes associated with defect behaviour in YBCO near the critical temperature, 20:1183 (IA;AU)
Spin
Spin gap behaviour of YBa_2 $(Cu_{1-x}$ $Zn_x)_4$ O_8, 20:2377 (IA;AU)
Squid Devices
Noise in high-T_c r.f. squids, 20:2383 (IA;AU)
Superconducting Films
Relations between structural and superconducting properties of bulk and thin film high-T_c materials, 20:2386 (R;DK)
Thermoelectric Properties
Thermoelectric power of YBCO: Ag composite superconductors, 20:2372 (IA;AU)
Twinning
Anomalous flux pinning by twin boundaries in single-crystalline YBa_2 Cu_3 O_7, 20:2379 (IA;AU)
Ultrasonic Testing
Quench recovery processes associated with defect behaviour in YBCO near the critical temperature, 20:1183 (IA;AU)
Wave Functions
Condensate localization by mesoscale disorder in high-T_c superconductors, 20:2364 (R;XA)
Zirconium Oxides
Electromagnetic response of high-Tc thick films, 20:2374 (IA;AU)
HIGHLY ENRICHED URANIUM
LEU ^{99}Mo target fabrication and testing: Overview, status, and plans, 20:839 (R;US)
HIPURE PROCESS
See DESULFURIZATION
HOELTER PROCESS
See DESULFURIZATION
HOFFMAN PROCESS
See COAL GASIFICATION
HOLES
Electrical-conductivity testing of latex gloves, 20:1487 (R;US)
HOLLY EVENT
See NUCLEAR EXPLOSIONS
HOT ATOM CHEMISTRY
Proceedings of the international seminar on the chemistry of high energy atoms, 20:1411 (R;JP)
HOT GAS CLEANUP
Facilitated transport ceramic membranes for high temperature H_2S removal, 20:17 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines (moving bed, fluid bed contactor/ceramic filter): Twenty-seventh quarterly status report, April–June 1994, 20:10 (R;US)
Integrated low emissions cleanup system for direct coal fueled turbines: Twenty-sixth quarterly report: Quarterly status for the period January–March 1994, 20:9 (R;US)
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 3, Test plan, 20:13 (R;US)
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)
Test results from the Department of Energy's pressurized fluidized bed combustion hot gas cleanup program, 20:18 (R;US)

HOT NUCLEI
Towards limiting temperatures in nuclei: The behaviour of collective motion, 20:2212 (R;FR)

HOT PLASMA
Studies on the transport and on the focusing of intense, high-energetic heavy ion beams for the production of high energy density in matter, 20:1551 (R;DE)

HOT SPOTS
ELIPGRID-PC: A PC program for calculating hot spot probabilities, 20:1827 (R;US)

HOUSES
Energy efficiency in military family housing: Inspection results, 20:1030 (R;US)
Exposure to radon and radon progeny in the indoor environment: Final report, 20:1707 (R;US)

HTGR TYPE REACTORS
Bases for the MHTGR source term and containment concepts, 20:772 (RA;XA)
High-level assessment of LANL ABC Design, 20:788 (R;US)
Impact of increasing MHTGR power on passive heat removal, 20:778 (RA;XA)
Modeling and analysis of heat transfer from the MHTGR core through a steel reactor vessel to the reactor cavity cooling system, 20:781 (RA;XA)
Passive decay and residual heat removal in the MHTGR, 20:777 (RA;XA)
Test apparatus of cooling panel system for MHTGR, 20:786 (RA;XA)

HTO
See HEAVY WATER

HUGENHOLTZ-PINES THEORY
See HYDROGEN

HUMAN POPULATIONS
See also A-BOMB SURVIVORS
Analysis of population and workers exposure in the context of decommissioning of Wismut uranium mining operations and clean up of wastes, 20:486 (RA;US)
Monitoring programme: Radioactive substances report for 1992, 20:1916 (I;GB)
Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey, 20:1910 (RA;US)

HUMANS
See HUMAN POPULATIONS

HUNGARY
Description of training activities and re-training system for nuclear professionals at the Paks Nuclear Power Plant, Hungary, 20:2502 (RA;XA)
Selection of the type of spent fuel storage at Paks NPP, 20:198 (RA;XA)

HUTCH EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

HYBRID ELECTRIC-POWERED VEHICLES
Current Hybrid Electric Vehicle performance based on temporal data from the world's largest HEV fleet, 20:1083 (R;US)
Electric and Hybrid Vehicle Program: Site Operator Program: Quarterly progress report, October–December, 1993 (first quarter of fiscal year 1994), 20:1077 (R;US)
Electric and Hybrid Vehicles Program: Seventeenth annual report to Congress for Fiscal Year 1993, 20:1075 (R;US)

HYDRAULIC RAMS
See PUMPS

HYDRIDES
See also MAGNESIUM HYDRIDES
PALLADIUM HYDRIDES
SILANES
TITANIUM HYDRIDES
Zeeman shifts and splittings of hydride vibrational lines in rare-earth doped calcium fluoride, 20:2293 (IA;AU)

HYDROBROMIC ACID
Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)

HYDROCARBONS
See also ALKENES
BENZENE
BENZOPYRENE
POLYCYCLIC AROMATIC HYDROCARBONS
Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)
Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1, 20:478 (R;US)
Site environmental report: 1993, 20:501 (R;US)

HYDROCHLORIC ACID
Chloride and mercury monitors for air toxics measurements, 20:71 (R;US)
Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)
Investigation of the oxidation of hydrochloric acid in scrubbing solutions containing hydrogen peroxide, 20:160 (R;EG)

HYDROCYANIC ACID
Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)

HYDROCYCLONES
See CYCLONE SEPARATORS

HYDRODYNAMICS
Computational design of hypervelocity launchers, 20:1444 (R;US)
Hydrodynamic operation analysis of a pulse with disks and rings column, 20:1298 (R;FR;In French)

HYDROELECTRIC POWER
Tenaska Washington II Generation Project: Tenaska Washington Partners II, L.P.: Mitigation Action Plan, 20:634 (R;US)
The use of Au-198 in evaluation of current efficiency in commercial aluminium reduction cell, 20:583 (IA;TH;In Thai)

HYDROELECTRIC POWER PLANTS
Lower Yakima Valley Wetlands and Riparian Restoration Project: Final environmental assessment, 20:638 (R;US)
Observations on gas bubble disease among adult smallmouth bass and squawfish in the lower Snake and mid-Columbia Rivers, 20:639 (R;US)

HYDROELECTRICITY
See HYDROELECTRIC POWER

HYDROFLUORIC ACID
Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)

HYDROGEN
Evaluation of hydrogen buildup in radioactive mixed waste drums, 20:367 (R;US)
Experimental investigations of electron capture from atomic hydrogen and deuterium by alpha particles: Final report, September 15, 1984–September 14, 1993, 20:2403 (R;US)
Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1), 20:402 (R;US)
Stable isotopes of hydrogen and oxygen in surface water and ground water at selected sites on or near the Idaho National Engineering Laboratory, Idaho, 20:1783 (R;US)
Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)

HYDROGEN 1 TARGET
New data on T_{20} in inclusive deuteron breakup at 9 GeV/c on protons and correlation between polarization observables, 20:2259 (R;XJ)
Polarization phenomena in deuteron-proton backward elastic scattering, d + p -> p + d, 20:2258 (R;XJ)

HYDROGEN 2
See DEUTERIUM

HYDROGEN 3
See TRITIUM

HYDROGEN BROMIDES
See HYDROBROMIC ACID

HYDROGEN CHLORIDES
See HYDROCHLORIC ACID

HYDROGEN CYANIDES
See HYDROCYANIC ACID
HYDROGEN FLUORIDES
See HYDROFLUORIC ACID
HYDROGEN HYDROXIDES
See WATER
HYDROGEN STORAGE
Dimensionally stable metallic hydride composition, 20:615 (PA;US)
HYDROGEN SULFATES
See SULFURIC ACID
HYDROGEN SULFIDES
Desulfurization of hot fuel with Z-Sorb III sorbent, 20:6 (R;US)
Facilitated transport ceramic membranes for high temperature H_2S removal, 20:17 (R;US)
High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)
Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)
HYDROGENASE
See HYDROGENASES
HYDROGENASES
Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, April 30, 1991–April 30, 1992, 20:1847 (R;US)
HYDROLOGY
Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL, 20:493 (R;US)
The use of environmental isotopes in ground water hydrology studies in Thailand, 20:1900 (IA;TH;In Thai)
HYDROTHERMAL CONVECTIVE SYSTEMS
See HYDROTHERMAL SYSTEMS
HYDROTHERMAL SYSTEMS
Integrated operation of hydro thermal system, 20:636 (I;LK)
HYDROXIDES
Correlations for the OH $A^2\Sigma^+(v'=0)$ electronic quenching cross-section, 20:1424 (R;US)
HYDROXYETHYLETHYLENEDIAMINETRI-ACETIC ACID
See HEDTA
HYDROXYL IONS
See ANIONS
HYDROXIDES
HYFLEX PROCESS
See COAL GASIFICATION
HYPERFINE STRUCTURE
Electron energy-loss spectroscopy study of thermal annealing of amorphous hydrogenated carbon, 20:1261 (IA;AU)
HYPERFRAGMENTS
See HYPERNUCLEI
HYPERGEOMETRIC FUNCTIONS
Asymptotics for the Kummer function of Bose plasmas, 20:2003 (R;AU)
HYPERNUCLEI
Limits on the window for halo phenomena, 20:2002 (R;FR)

I

I-BEAM TYPE REACTORS
See ION BEAM FUSION REACTORS
IAEA
Assistance to nuclear power user countries under the IAEA Technical Co-operation Programme, 20:2487 (RA;XA)
Environment, 1980-1993: International Atomic Energy Agency publications, 20:2513 (I;XA)
Highlights of IAEA activities in the field of radiation application, 20:2510 (IA;JP)
IAEA activities in nuclear power plant personnel training and qualification, 20:2490 (RA;XA)
Nuclear and radiological safety, 1980-1993: International Atomic Energy Agency publications, 20:1918 (I;XA)
Nuclear power, nuclear fuel cycle and waste management, 1980-1993: International Atomic Energy Agency publications, 20:2514 (I;XA)
Quality assurance technical cooperation and training, 20:2492 (RA;XA)
The Agency's technical co-operation activities in 1993: Report by the Director General, 20:2462 (R;XA)
The annual report for 1993, 20:2461 (R;XA)
Training related activities, 20:2494 (RA;XA)
Training-related infrastructure development and evaluation of training performance, 20:2491 (RA;XA)
[Guidelines for IAEA fellows and trainees], 20:2576 (RA;XA)
[Technical Cooperation programmes organized by Division of Nuclear Power], 20:2489 (RA;XA)
IAEA AGREEMENTS
Convention on nuclear safety. Final act, 20:2575 (R;XA;In Arabic, Chinese, English, French)
IAEA SAFEGUARDS
Application to plutonium and uranium in safeguards, 20:554 (IA;JP;In Japanese)
Determining information management needs for enhanced international safeguards, 20:558 (R;US)
NPT and the peaceful use of nuclear energy, 20:951 (I;XA)
NPT safeguards and the peaceful use of nuclear energy, 20:946 (I;XA)
ICE
Nitrate analysis of snow and ice core samples collected in the vicinity of a waste detonation event, McMurdo Station, Antarctica, 20:1792 (R;US)
ICI PROCESS
See DESULFURIZATION
ICP MASS SPECTROSCOPY
Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)
IDAHO
Concentrations of dissolved radon-222 in water from selected wells and springs in Idaho, 1989-91, 20:1784 (R;US)
IDAHO NATIONAL ENGINEERING LABORATORY
A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory, 20:259 (R;US)
Characterization of void volume VOC concentration in vented TRU waste drums - an interim report, 20:261 (R;US)
Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91, 20:451 (R;US)
Criticality safety evaluation for TRU waste in storage at the RWMC, 20:496 (R;US)
INEL storage facility for sealed sources from the commercial sector, 20:452 (R;US)
Idaho National Engineering Laboratory site development plan, 20:1782 (R;US)
Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April–June, 1994, 20:1433 (R;US)
Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)
Performance indicators for 4th quarter CY 1993, 20:456 (R;US)
Radioactive waste management information for 1993 and record-to-date, 20:234 (R;US)
IDENTIFICATION SYSTEMS
Bar-code automated waste tracking system, 20:556 (R;US)
IEUS
Coordination and optimisation of collaboration between wind park, solar park and the weak electrical supply grid on the island of Kythnos: Final report. Period covered: July 1, 1985 to December 31, 1991, 20:1059 (I;DE;In German)
IFP PROCESS
See DESULFURIZATION
IGT DEHYDRODESULFURIZATION PROCESS
See DESULFURIZATION

ILLINOIS
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)
IMAGE PROCESSING
An image cancellation approach to depth-from-focus, 20:2562 (R;US)
Synthetic aperture radar processing with polar formatted subapertures, 20:1667 (R;US)
IMPACT SHOCK
A comparison of phase change phenomena in CTH with experimental data, 20:1682 (R;US)
IMPACT TESTS
On the Taylor test, Part 3: A continuum mechanics code analysis of steady plastic wave propagation, 20:1154 (R;US)
INCINERATION
See COMBUSTION
INCLUSIVE DISTRIBUTION
See INCLUSIVE INTERACTIONS
INCLUSIVE INTERACTIONS
Measurement of inclusive electron cross section in $\gamma\gamma$ collisions, 20:2169 (RA;JP)
INCOLOY 800H
Low cycle fatigue at increased temperature under operating conditions, 20:1103 (I;DE;In German)
INCOLOY 825
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
INCOLOY ALLOYS
Incology alloy 908 data handbook, 20:1110 (R;US)
INCOMPRESSIBLE FLOW
1/f noise in two-dimensional fluids, 20:2406 (R;US)
INCONEL 625
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
INCONEL 738
Implementation of a structural dependent model for the superalloy IN738LC in ABAQUS-code, 20:1147 (R;DE;In German)
Numerical description of creep of highly creep resistant alloys, 20:1140 (I;DE;In German)
INDIA
Away-from-reactor (AFR) storage concepts - The Indian experience, 20:200 (RA;XA)
Training for qualification and competence of nuclear power plant personnel in India, 20:2477 (RA;XA)
INDIUM PHOSPHIDE SOLAR CELLS
Growth and development of GaInAsP for use in high-efficiency solar cells: Final subcontract report, 1 July 1991–30 December 1993, 20:689 (R;US)
INDIUM SELENIDE SOLAR CELLS
Polycrystalline $CuInSe_2$ and CdTe PV solar cells: Annual subcontract report, 15 April 1993–14 April 1994, 20:690 (R;US)
INDOOR AIR POLLUTION
Indoor Environment Program, 1993 annual report, 20:1024 (R;US)
INDUCED RADIOACTIVITY
See RADIOACTIVITY
INDUSTRIAL PLANTS
See also BIOMASS CONVERSION PLANTS
COAL GASIFICATION PLANTS
COAL LIQUEFACTION PLANTS
DESALINATION PLANTS
FEED MATERIALS PLANTS
NATURAL GAS PROCESSING PLANTS
SYNTHETIC FUELS REFINERIES
WASTE PROCESSING PLANTS
Results of the radiological and beryllium verification survey at the Peek Street Site, Schenectady, New York (SY001V), 20:505 (R;US)
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)
INDUSTRIAL RADIOGRAPHY
See also X-RAY RADIOGRAPHY
Industrial radiography, 20:1483 (I;GB)
INDUSTRIAL SECTOR
See INDUSTRY
INDUSTRIAL WASTES
Industrial waste needs assessment: Phase 1, 20:1054 (R;US)
Remedial Investigation Report on Chestnut Ridge Operable Unit 2 (Filled Coal Ash Pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. Main Text, 20:735 (R;US)
Wastes and by-products - alternatives for agricultural use, 20:1035 (R;US)
INDUSTRY
See also COAL INDUSTRY
CONSTRUCTION INDUSTRY
ELECTRIC POWER INDUSTRY
FERTILIZER INDUSTRY
NATURAL GAS INDUSTRY
NUCLEAR INDUSTRY
PETROLEUM INDUSTRY
SOLAR INDUSTRY
Industrial waste needs assessment: Phase 1, 20:1054 (R;US)
Nuclear techniques in agriculture and industry in China, 20:954 (I;XA)
INERTIAL CONFINEMENT
Transport efficiency studies for light-ion inertial confinement fusion, 20:2446 (R;US)
INERTIAL SEPARATORS
See also CYCLONE SEPARATORS
Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3070), 20:149 (R;US)
INFORMATION
See also PUBLIC INFORMATION
Air Pollution Abatement
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Carbon Dioxide
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Coal Gasification
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Coal Liquefaction Plants
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Composite Materials
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Data Acquisition
Present status of petroleum substitution energy (EC), 20:1090 (R;JP;In Japanese)
Present status of petroleum substitution energy (France), 20:1092 (R;JP;In Japanese)
Present status of petroleum substitution energy (Germany), 20:1093 (R;JP;In Japanese)
Present status of petroleum substitution energy (UK), 20:1091 (R;JP;In Japanese)
Energy Conservation
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Energy Demand
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Energy Substitution
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)

Energy Supplies
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
France
Present status of petroleum substitution energy (France), 20:1092 (R;JP;In Japanese)
Gas Turbines
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Geothermal Power Plants
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Heat Pumps
Joint research project with researchers from EC countries who relate to petroleum substitution energy, 20:1027 (R;JP;In Japanese)
Liquefied Natural Gas
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Management
Abbreviations, acronyms, and initialisms frequently used by Martin Marietta Energy Systems, Inc.: Second edition, 20:2569 (R;US)
Nuclear Power Plants
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)
Solar Power Plants
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)

INFORMATION RETRIEVAL
Survey on the actual energy consumption status for the residential/economical use, 20:998 (R;JP;In Japanese)

INFORMATION SYSTEMS
Automated Transportation Management System (ATMS) user's manual: Revision 1, 20:209 (R;US)
VAXNEWS version 3.12: Management manual, 20:2549 (R;FR)
VAXNEWS version 3.12: User manual, 20:2548 (R;FR)
[Development of a gas information system (GASIS)]: Quarterly technical progress report, March 1994–May 1994, 20:135 (R;US)

INHALATION TOXICOLOGY RESEARCH INSTITUTE
Site environmental report: 1993, 20:501 (R;US)

INORGANIC ACIDS
See also HYDROBROMIC ACID
HYDROCHLORIC ACID
HYDROCYANIC ACID
HYDROFLUORIC ACID
SULFURIC ACID
A process for separating acid-sugar mixtures using ion exclusion chromatography, 20:627 (R;US)

INORGANIC COMPOUNDS
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)

INORGANIC ION EXCHANGERS
See also ZEOLITES
Natural sorbents as barriers against migration of radionuclides from radioactive waste repositories, 20:282 (I;BG)

INSOLATION
Thermal modeling of packages for normal conditions of transport with isolation, 20:1429 (R;US)

INSTRUMENTS (MEASURING)
See MEASURING INSTRUMENTS

INSULATION (THERMAL)
See THERMAL INSULATION

INTEGRAL EQUATIONS
Solutions of TEAM Problem No. 13 using integral equations in a sequential and parallel computing environment, 20:2524 (R;US)

INTEGRATED CIRCUITS
Comparison of the resistance of integrated circuits to various types of nuclear radiation, 20:1662 (IA;PL)
Complementary GaAs junction-gated heterostructure field effect transistor fabrication for integrated circuits, 20:2307 (R;US)
Final report for design and development SAWAFE peak detector chip, 20:1502 (R;US)
Plasma processing for integrated circuits, 20:1498 (R;US)
Three-dimensional image processing for acoustic microscopy, 20:1497 (R;US)

INTEGRATED ENERGY UTILITY SYSTEMS
See IEUS

INTERACTING BOSON MODEL
E1 and E3 transition rates in the sdf-IBA, 20:2206 (R;US)

INTERCONNECTED POWER SYSTEMS
Project considerations and design of systems for wheeling cogenerated power, 20:1040 (R;US)

INTERFACES
Advanced growth and surface analysis system for in situ studies of interface formation: Annual technical report, 20:2312 (R;US)
Photoemission and ferromagnetism, 20:2310 (R;US)
Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)
Topography of neutron scattering from diblock copolymer film, 20:1239 (R;US)
Ultrafast optical studies of surface reaction processes at semiconductor interfaces: Progress report, 20:682 (R;US)

INTERFACES (EQUIPMENT)
See EQUIPMENT INTERFACES

INTERFEROMETRY
Observation of the scalar Aharonov-Bohm effect by neutron interferometry, 20:2004 (R;AU)

INTERMEDIATE VECTOR BOSONS
See also W PLUS BOSONS
Z NEUTRAL BOSONS
Anomalous WWZ couplings and $K_L \rightarrow \mu^+ \mu^-$, 20:2184 (R;AU)
Measurement of W and Z production cross-sections in $p\bar{p}$ collisions at $\sqrt{s} = 1.8$ TeV, 20:2154 (R;US)

INTERNAL COMBUSTION ENGINES
See also DIESEL ENGINES
GAS TURBINE ENGINES
SPARK IGNITION ENGINES
Early detection of failures in internal combustion engines by analysing the angular velocity at the crankshaft, 20:1066 (I;DE;In German)
Fundamental studies of fuel chemistry as related to internal combustion engine phenomena: Technical progress report, July 1, 1988–June 30, 1989, 20:130 (R;US)

INTERNATIONAL ATOMIC ENERGY AGENCY
See IAEA

INTERVENTIONS
See ADMINISTRATIVE PROCEDURES

INTRUSION DETECTION SYSTEMS
A field test and evaluation of exterior fiber optic intrusion detection sensors, 20:1446 (R;US)
Security Transition Program Office; progress report, 20:548 (R;US)

ION BEAM FUSION REACTORS
Induction linacs for heavy ion fusion, 20:2445 (R;US)
Radiation-driven targets for heavy-ion fusion, 20:2447 (R;US)

ION BEAM TARGETS
Radiation-driven targets for heavy-ion fusion, 20:2447 (R;US)

ION BEAM TYPE REACTORS
See ION BEAM FUSION REACTORS

ION BEAMS
See also RADIOACTIVE ION BEAMS
Confinement and stability of crystalline beams in storage rings, 20:1530 (R;US)
Crystalline beams, 20:1527 (R;US)
Ion beam technology for nanostructure and interface engineering, 20:2348 (IA;JP;In Japanese)
Noninterceptive transverse emittance measurement diagnostic for an 800 MeV H^- transport line, 20:1589 (R;US)
Studies on the transport and on the focusing of intense, high-energetic heavy ion beams for the production of high energy density in matter, 20:1551 (R;DE)

Study of the many-dimensional transverse phase-space distributions of intense ion beams, 20:1550 (R;DE;In German)
The wide-range X-ray scattering of structural changes in PETP occurring under heavy ions irradiation, 20:2357 (IA;PL)
Transport efficiency studies for light-ion inertial confinement fusion, 20:2446 (R;US)

ION BLOCKING
See ION CHANNELING

ION CHANNELING
Ion beam mixing of isotopic bilayers, 20:1136 (IA;AU)

ION EMISSION
Pre-scission light particle emission in the reaction ^{144}Sm (^{32}S, fission) at E_{lab} = 838 MeV: determining of a time scale, 20:2273 (R;FR;In French)

ION EXCHANGE
Separation of yttrium from strontium radionuclides on α-crystalline antimony peroxide, 20:1319 (IA;PL)

ION EXCHANGE CHROMATOGRAPHY
Elaboration of the universal method of radiochemical separation of molybdenum from irradiated biological samples for NAA purposes, 20:1323 (IA;PL)

ION EXCHANGE MEMBRANES
See MEMBRANES

ION IMPLANTATION
A study of transition metal implanted single crystal $YBa_2Cu_3O_{7-\delta}$, 20:1217 (IA;AU)
CEMS studies of phase transformation in the surface layer of SW12C steel after nitrogen implantation, 20:2358 (IA;PL)
Conductivity in insulators due to implantation of conducting species, 20:2360 (R;AU)
Cross sectional imaging of single crystal materials by ion beam analysis, 20:2349 (IA;AU)
Implantation induced amorphization in Si, GaAs, and GaAsP, 20:2356 (IA;PL)
Zeeman Effect of the shallow acceptors Boron, Gallium and Thallium in Germanium at magnetic fields up to 7 T, 20:2285 (IA;AU)

ION MICROSCOPY
Atom probe field ion microscopy and related topics: A bibliography 1993, 20:1488 (R;US)

ION SOURCES
A retarding field energy analyser to measure the energy distributions of liquid metal ion sources, 20:1628 (R;DE)

ION-ATOM COLLISIONS
Experimental study of interactions of highly charged ions with atoms at keV energies: Progress report, February 16, 1993–April 15, 1994, 20:2288 (R;US)

IONIZATION CALORIMETERS
See SHOWER COUNTERS

IONIZING RADIATIONS
See also GAMMA RADIATION
X RADIATION
Molecular mechanisms in radiation damage to DNA: Progress report, 20:1914 (R;US)

IONOPHORESIS
See ELECTROPHORESIS

IONOSPHERE
The use of empirical models to investigate GPS derived total electron content, 20:2014 (R;XA)

IRON
Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes, 20:1370 (R;US)
Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994, 20:128 (R;US)
Electrochemical recovery of iron from iron and steel pickling wastes, 20:1339 (R;EG)
Magnetic x-ray circular dichroism in spin-polarized photoelectron diffraction, 20:2342 (R;US)

IRON 65
Separation and implantation of relativistic ^{86}Kr-fragments at the FRS: Half-life measurement by ion-β time-correlations, 20:2246 (R;FR)

IRON ADDITIONS
The relation between ultrasonic properties and the critical temperature in Fe doped BSCCO, 20:1203 (IA;AU)

IRON ALLOYS
See also IRON ADDITIONS
IRON BASE ALLOYS
A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
Computational modeling of diffusion-controlled transformations in ternary systems, 20:1106 (R;US)
Diffuse neutron scattering studies of single crystal specimens of $Fe_{3-x}Mn_xSi$, 20:1123 (IA;AU)
Magnetization and magnetostriction in highly magnetostrictive materials, 20:1145 (R;US)
Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Structural and magnetic properties of Nd $Ni_{8.6-x}Fe_xSi_{2.4}$, 20:1138 (IA;AU)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)

IRON BASE ALLOYS
See also STEELS
Inhibition of sulfide growth on iron by means of alloying elements and by means of carbon deposition in the gaseous phase: Final report, 20:1117 (R;DE;In German)

IRON CARBIDES
Formation of iron carbide-nitrides by mechnochemical reaction between iron and organic H(CN)- ring compounds, 20:1180 (IA;AU)

IRON COMPOUNDS
See also IRON CARBIDES
Evaluation of fine-particle catalysts: Activity testing results and phase identification using Mossbauer spectroscopy, 20:52 (R;US)
Moessbauer studies of iron-bearing minerals in coal and correlations with coal ash content, 20:58 (IA;PL)

IRON GARNETS
See FERRITE GARNETS

IRRADIATION DEVICES
Cooperative study of clinical benefits from use of the fully portable blood irradiator, 20:932 (R;US)

IRRADIATION RIGS
See IRRADIATION DEVICES

ISING MODEL
A series of quantum spin models on 3-dimensional lattices, 20:2391 (IA;AU)
Monte Carlo simulations with indefinite and complex-valued measures, 20:2027 (R;AU)

ISLANDS
See also SRI LANKA
WEST INDIES
Possibility of introducing new energy technologies to the South Pacific island countries, 20:1000 (R;JP;In Japanese)

ISOBARIC SPIN
See ISOSPIN

ISOBUTYLENE
See 2-METHYLPROPENE

ISOSPIN
Study of the isospin symmetry breaking in the light quark sea of the nucleon from the Drell-Yan process, 20:2385 (R;FR)

ISOTOPE APPLICATIONS
See also TRACER TECHNIQUES
Annual report 1992, 20:1418 (I;PL)
Application of isotopes and radiation for industry and environmental protection, 20:588 (IA;PL)
Radiation technologies and nuclear techniques friendly to man and environment, 20:590 (IA;PL)

ISOTOPE DATING
New development sin age measurement: The present and future of ultra-sensitive radiocarbon dating with accelerator mass spectrometry, 20:1304 (IA;JP;In Japanese)

ISOTOPE ENRICHMENT
See ISOTOPE SEPARATION

ISOTOPE PRODUCTION
Production and supply of radioisotopes with high-energy particle accelerators current status and future directions, 20:580 (IA;JP)
The use of radioisotopes in human experiments: comments in response to recent media articles, 20:1417 (I;AU)

ISOTOPE PRODUCTION REACTORS
See also HIFAR REACTOR
LEU ^{99}Mo target fabrication and testing: Overview, status, and plans, 20:839 (R;US)

ISOTOPE SEPARATION
Development of IAEA safeguards at low enrichment uranium fuel fabrication plants, 20:161 (R;EG)
Separation factors of H/D and $^{16}O/^{18}O$ in permeation of natural water through PTFE membranes, 20:1320 (IA;PL)

ISOTOPIC SEPARATION
See ISOTOPE SEPARATION

ISOTOPIC SPIN
See ISOSPIN

ITER TOKAMAK
Assessment of CONTAIN and MELCOR for performing LOCA and LOVA analyses in ITER, 20:2437 (R;US)
Joule heating of the ITER TF cold structure: Effects of vertical control coil currents and ELMS, 20:2431 (R;US)
Projection of ITER performance using the multi-machine L- and H- mode databases, 20:2423 (R;US)
Recycling source terms for edge plasma fluid models and impact on convergence behavior of the BRAAMS 'B2' code, 20:2440 (R;DE)
Travel to Germany for a meeting of the ITER Joint Central Team: Foreign trip report, October 19–28, 1993, 20:2407 (R;US)

ITERATIVE METHODS
A worse-case example using linesearch methods for numerical optimization with inexact gradient evaluations, 20:2527 (R;US)

ITRI
See INHALATION TOXICOLOGY RESEARCH INSTITUTE

J

J PSI-3097 MESONS
Polarization of charmonium in πN collisions, 20:2182 (R;US)

J-3105 RESONANCES
See J PSI-3097 MESONS

JAPAN
Education and training program at Hamaoka Nuclear Power Station, 20:2478 (RA;XA)
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
R and D on spent fuel storage in Japan, 20:199 (RA;XA)
Travel to Japan for discussion on renewable energy projects: Foreign trip report, February 9–March 4, 1994, 20:614 (R;US)

JECCO PROCESS
See DESULFURIZATION

JET ENGINE FUELS
Field demonstration of rapid turnaround, multilevel groundwater screening, 20:1821 (R;US)

JET MODEL
Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha^2_s)$, 20:2143 (R;DE;In German)
Uncertainties in in calculations of the $\gamma\gamma$minijet cross section, 20:2140 (RA;DE)

JOB TRAINING
See TRAINING

JORUM EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

JUNCTIONS (SEMICONDUCTOR)
See SEMICONDUCTOR JUNCTIONS

K

KALUZA-KLEIN THEORY
The geodesic motion in Kaluza-Klein spinning space, 20:2035 (R;XA)

KANSAS
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)

KAON-KAON INTERACTIONS
Relativistic effects in the scalar meson dynamics, 20:2163 (R;FR)

KAONIUM
$\pi\pi$ and KK-bar channel coupling. Pt. 2: The $f_0(975)$ meson and KK-bar threshold effects, 20:2193 (R;FR)

KAZAKHSTAN
Briefing notes on Kazakhstan, 20:2503 (RA;XA)

KEK INTERS. STORAGE ACCELERATOR
See TRISTAN STORAGE RINGS

KENTUCKY
Subsurface fracture mapping using microearthquakes detected during primary oil production, Clinton County, Kentucky, 20:122 (R;US)

KETONES
Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)

KICKER MAGNETS
Impedance measurements of the LEB extraction kicker magnet, 20:1600 (R;US)

KINASES
See PHOSPHOTRANSFERASES

KINASES (PHOSPHOTRANSFERASES)
See PHOSPHOTRANSFERASES

KLYSTRONS
Design of an RF window for L-band CW klystron based on thermal-stress analysis, 20:1577 (RA;JP;In Japanese)
Development of an X-band klystron modulator using a pulse-forming line and magnetic switch, 20:1573 (RA;JP;In Japanese)
Development status of an intense beam klystron, 20:1509 (R;US)
High power test of L-band RF window using resonant ring, 20:1578 (RA;JP;In Japanese)
High-power test of a prototype of power supplies for UHF klystrons, 20:1571 (RA;JP;In Japanese)
On limitations and improvements of klystron design code 'JP-NDISK', 20:1569 (RA;JP;In Japanese)
RF Feedback Analysis for 4 cavities per klystron in PEP-II, 20:1611 (R;US)
The design and performance of 150-MW S-band klystrons, 20:1594 (R;US)
Upgrade of the PF linac klystron modulator for the KEK B-factory project, 20:1572 (RA;JP;In Japanese)

KNOCK-ON ELECTRONS
See ELECTRONS

KOONGARRA DEPOSIT
Alligator Rivers Analogue project - Geologic Setting: Final Report - Volume 2, 20:144 (I;AU)
Alligator Rivers Analogue project. Geochemical Data Bases: Final Report - Volume 10, 20:1804 (I;AU)
Alligator Rivers Analogue project. Geomorphology and paleoclimatic history: Final Report - Volume 3, 20:1801 (I;AU)
Alligator Rivers Analogue project. Geophysics, petrophysics and structure: Final Report - Volume 4, 20:145 (I;AU)
Alligator Rivers Analogue project. Groundwater Chemistry: Final Report - Volume 7, 20:1802 (I;AU)
Alligator Rivers Analogue project. Weathering and its effects on uranium redistribution: Final Report - Volume 9, 20:1803 (I;AU)
The effect of weathering on the distribution of uranium and associated elements at Koongarra, Northern Territory, Australia, 20:1806 (I;AU)

KOPPERS VACUUM CARBONATE PROCESS
See DESULFURIZATION

KOREA (NORTH)
See NORTH KOREA

KOREA (SOUTH)
See REPUBLIC OF KOREA
KOZLODUY-1 REACTOR
Report to: 3. steering committee meeting of the extrabudgetary programme on safety of WWER NPPs, 20:763 (RA;XA)
KRYPTON 86
Separation and implantation of relativistic ^{86}Kr-fragments at the FRS: Half-life measurement by ion-β time-correlations, 20:2246 (R;FR)
KUREHA ACETATE PROCESS
See DESULFURIZATION
KVB PROCESS
See DESULFURIZATION

L

L CODES
A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores, 20:2556 (R;US)
LA REINA REACTOR
See RESEARCH REACTORS
LABELLED COMPOUNDS
See also RADIOPHARMACEUTICALS
A facility with induction furnace for boron nitride production, 20:1360 (IA;PL)
Labelling of meta-iodobenzylguanidine with iodine-131 (I-131-MIBG) for adrenal gland diagnosis, 20:1414 (I;TH;In Thai)
LABORATORIES
Analytical services FY 1995 multi-year program plan fiscal year work plan, WBS 1.5.1, 20:214 (R;US)
Grimsel test site: preparation and performance of migration experiments with radioisotopes of sodium, strontium and iodine, 20:1832 (R;CH)
LABCORE post release 1.0 development system project management plan, 20:406 (R;US)
Low-level waste certification plan for the WSCF Laboratory Complex, 20:335 (R;US)
Low-level waste characterization plan for the WSCF Laboratory Complex, 20:336 (R;US)
Waste management plan for Hanford spent nuclear fuel characterization activities, 20:348 (R;US)
LABORATORY EQUIPMENT
See also GLOVEBOXES
MANIPULATORS
Road Transportable Analytical Laboratory (RTAL) System: Quarterly technical report, March 1993–May 1993, 20:1788 (R;US)
LAGRANGE FIELD EQUATIONS
See LAGRANGIAN FIELD THEORY
LAGRANGIAN FIELD THEORY
The space of solutions of Toda field theory, 20:2068 (R;AU)
LAKES
A mathematical model of the temperature and current distributions in a deep stratified reservoir, 20:633 (R;US)
LAMPF LINAC
New technique for determining boundary dose from the Los Alamos Meson Physics Facility, 20:1767 (R;US)
Noninterceptive transverse emittance measurement diagnostic for an 800 MeV H^- transport line, 20:1589 (R;US)
LAND FILLS
See SANITARY LANDFILLS
LAND POLLUTION
Forest decline in ecosystem perspective, 20:1953 (IA;DE)
LAND RECLAMATION
Phase I ResonantSonic CRADA report, 20:1496 (R;US)
LAND TRANSPORT
Transportation energy use in Mexico, 20:1032 (R;US)
LANDFILLS
See SANITARY LANDFILLS
LANGMUIR OSCILLATIONS
See PLASMA WAVES
LANL
In-place testing summary (1992): Progress report, 20:286 (R;US)
Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico, 20:459 (R;US)
Re-engineering facilities management at Los Alamos: Managing the behavioral change, 20:2516 (R;US)
Specific activities and DOE-STD-1027-92 hazard Category 2 thresholds, LANL fact sheet, 20:502 (R;US)
LANTHANIDES
See RARE EARTHS
LANTHANUM CHROMITES
See LANTHANUM OXIDES
LANTHANUM OXIDES
EPR of a nitroxide adsorbed on SiO_2 and La_2O_3, 20:1355 (IA;PL)
LAPLACE TRANSFORMATION
The PROSAIC Laplace and Fourier Transform, 20:2532 (R;US)
LASER BEAM MACHINING
Computational model of drilling with high radiance pulsed lasers, 20:1451 (R;US)
Laser materials processing at Sandia National Laboratories, 20:1164 (R;US)
LASER DOPPLER ANEMOMETERS
Measurement of two velocity components in the vicinity of the wall of a turbulent fluid flow by means of a Laser-Doppler-Anemometer submerged into the fluid, 20:1467 (I;DE;In German)
LASER MATERIALS
An investigation of the chemical and physical properties of pristine, electrochromically damaged, and photochromically damaged $KTiOPO_4$ (KTP) using surface analytical and optical spectroscopic techniques, 20:1503 (R;US)
Molecular design concept for multi-kilovolt x-ray amplification: Final report, December 13, 1990–December 14, 1993, 20:2279 (R;US)
LASER RADIATION
Approach to compact terawatt CO_2 laser system for particle acceleration, 20:1516 (R;US)
Waveguiding by axicon-focused laser beams, 20:1515 (R;US)
LASER TARGETS
Effects of plasma physics on capsule implosions in gas-filled hohlraums, 20:2441 (R;US)
Low density gas and foam targets for ICF long scale length plasma experiments: Fabrication & characterization, 20:2442 (R;US)
LASER WELDING
Laser materials processing at Sandia National Laboratories, 20:1164 (R;US)
LASER-PRODUCED PLASMA
Observation of strong emission from NeIX and NeX transitions in a laser-driven plasma, 20:1510 (R;US)
LASERS
See also FREE ELECTRON LASERS
GAS LASERS
SOLID STATE LASERS
X-RAY LASERS
LISK-BROOM: Clearing near-Earth space debris in 4 years using a 20-kW, 530-nm repetitively pulsed laser, 20:1441 (R;US)
Reactor pumped laser research at the Sandia National Laboratories pulsed reactor facilities, 20:1506 (R;US)
LATENT HEAT STORAGE
IEA Implementing Agreement: energy conservation through energy storage. Annex 5: Full scale latent heat storage installations. Final report, 20:893 (I;DE)
LATEX
Test trial radiation vulcanization of natural rubber latex in Jakarta Indonesia, 20:586 (I;LK)
The effect of proteins on the aging properties of radiation vulcanized natural rubber latex, 20:1381 (I;PH)
LATIN AMERICA
See also MEXICO
Energy profiles of selected Latin American and Caribbean countries: Report series No. 2, 20:974 (R;US)
Regional overview of Latin American and Caribbean energy production, consumption, and future growth: Report series No. 1, 20:973 (R;US)
LATTICE DEFECTS
See CRYSTAL DEFECTS

LATTICE FIELD THEORY
The Hamiltonian of SU(2) lattice gauge theory in approximate tri-diagonal form, 20:2073 (R;AU)
Topological zero modes in Monte Carlo simulations, 20:2078 (R;DE)
Two dimensional simplicial paths, 20:2051 (R;XA)
LATTICES (CRYSTAL)
See CRYSTAL LATTICES
LAWRENCE BERKELEY LABORATORY
Chemical sciences, annual report 1993, 20:1365 (R;US)
Lawrence Berkeley Laboratory 1993 Site Environmental Report, 20:921 (R;US)
LAWRENCE LIVERMORE LABORATORY
LLNL NESHAPs, 1993 annual report, 20:515 (R;US)
LCRE REACTOR
See EXPERIMENTAL REACTORS
LEACHATES
GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
LEAD
A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
Confirmatory experiments for the United States Department of Energy Accelerator Production of Tritium Program: Neutron, triton and radionuclide production by thick targets of lead and tungsten bombarded by 800 MeV protons, 20:1587 (R;US)
Visible fluorescence of weathered lead, 20:1665 (R;US)
LEAD COMPOUNDS
See also LEAD OXIDES
LEAD TUNGSTATES
PZT
Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report, 20:1362 (I;DE;In German)
Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)
Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)
LEAD METHOD
See ISOTOPE DATING
LEAD OXIDES
Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes, 20:1370 (R;US)
Visible fluorescence of weathered lead, 20:1665 (R;US)
LEAD TUNGSTATES
Spectroscopy and origin of radiating centers in $PbWO_4$ single crystals, 20:1282 (R;FR)
LEAD ZIRCONITE TITANATE
See PZT
LEAKAGE
See LEAKS
LEAKS
Predicting the pressure driven flow of gases through micro-capillaries and micro-orifices, 20:1442 (R;US)
LEASING
Research on the promotion measures to introduce new energy and energy-saving technologies with a leasing system, 20:929 (R;JP;In Japanese)
LEED
See ELECTRON DIFFRACTION
LENNARD-JONES POTENTIAL
Collision integrals for the Lennard-jones (n-6) potential for 23 values of n ranging from 6 to proper to, 20:2287 (R;EG)
LEP STORAGE RINGS
A normal form approach to the theory of nonlinear betatronic motion, 20:1531 (R;XC)
Precision determination of the Z^0 resonance parameters, 20:1655 (R;NO)
The second level trigger of the L3 experiment. Pt. 1: The implementation, 20:1583 (R;FR)
The second level trigger of the L3 experiment. Pt. 2: The event selection, 20:1584 (R;FR)
LEPTONS
See also ELECTRONS
HEAVY LEPTONS
NEUTRINOS
Can the electric charges of elementary particles change with time?, 20:2200 (R;AU)
Study of the simplest realistic Higgs sector in quark-lepton symmetric models, 20:2183 (R;AU)
LEUKEMOGENESIS
Effect of radiation on transgenic mice carrying a variety of oncogenes, 20:1929 (RA;JP;In Japanese)
Gene rearrangement and radiation carcinogenesis: BCR/ABL and RET oncogene, 20:1931 (RA;JP;In Japanese)
The effect of calorie restriction of radiation-induced myeloid leukemogenesis, 20:1940 (RA;JP;In Japanese)
LEVEL DENSITY
See ENERGY LEVELS
LEVEL SCHEMES
See ENERGY LEVELS
LEVITATED TRAINS
Improved high speed maglev design, 20:1081 (PA;US)
Integrated null-flux suspension and multiphase propulsion system for magnetically-levitated vehicles, 20:1080 (PA;US)
LICENSING PROCEDURES
Model tracking system for low-level radioactive waste disposal facilities: License application interrogatories and responses, 20:567 (R;US)
LICENSING REGULATIONS
Indexes to Nuclear Regulatory Commission Issuances, January–June 1994, 20:794 (R;US)
LIDAR
See OPTICAL RADAR
LIE SUPERALGEBRA
See GRADED LIE GROUPS
LIGHT GUIDES
See OPTICAL FIBERS
LIGHT SOURCES
Light shaping diffusers™ improve aircraft inspection, 20:1033 (R;US)
LIGHT WATER COOLED REACTORS
See WATER COOLED REACTORS
LIGNITE
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Investigation of coal structure: Final report, 20:54 (R;US)
LIMITING VALUES
Search for neutral particles in nonminimal SUSY model, 20:2189 (RA;DE)
LINACS
See LINEAR ACCELERATORS
LINEAR ACCELERATORS
See also LAMPF LINAC
LINEAR COLLIDERS
QUADRUPOLE LINACS
SACLAY LINAC
WAKEFIELD ACCELERATORS
Beam Bunching
Study of a double gapped buncher for proton linac, 20:1560 (RA;JP;In Japanese)
Beam Focusing Magnets
Design of MEBT short Q-magnets with large bores using MAFIA for the JHP proton linac, 20:1561 (RA;JP;In Japanese)
R and D works of the DTL for the BTA in JAERI, 20:1563 (RA;JP;In Japanese)
Beam Injection
Simulation and steering in the intertank matching section of the ground test accelerator, 20:1588 (R;US)
Beam Transport
Design of a beam transport line between the RFQ and the DTL for the 1-GeV proton linac, 20:1562 (RA;JP;In Japanese)

Simulation and steering in the intertank matching section of the ground test accelerator, 20:1588 (R;US)

Control Systems
RF control of ICR proton linac, 20:1556 (RA;JP;In Japanese)

Design
New developments in high average power short-pulse induction accelerators for industrial and environmental applications, 20:1525 (R;US)

Drift Tubes
Cold model test of a DTL with transition from 4π to 2π-mode acceleration, 20:1538 (RA;JP;In Japanese)

Klystrons
60MW S-band pulse klystron, 20:1566 (RA;JP;In Japanese)
Design of an RF window for L-band CW klystron based on thermal-stress analysis, 20:1577 (RA;JP;In Japanese)
Development of X-band high power pulsed klystrons, 20:1570 (RA;JP;In Japanese)
High power test of L-band RF window using resonant ring, 20:1578 (RA;JP;In Japanese)
Multipactors in klystron cavities, 20:1568 (RA;JP;In Japanese)
Performance of the 46MW klystron for KEK B-factory, 20:1567 (RA;JP;In Japanese)

Microwave Equipment
Application of traveling-wave type RF window in L and S bands, 20:1579 (RA;JP;In Japanese)
Development of an S-band RF window for linear colliders, 20:1580 (RA;JP;In Japanese)
Development of the S-band high power RF load. 3, 20:1581 (RA;JP;In Japanese)
Production and high power test of an S-band SLED with dual side-wall coupling irises, 20:1574 (RA;JP;In Japanese)

Research Programs
Proceedings of the 19th linear accelerator meeting in Japan, 20:1512 (R;JP;In Japanese, English)

Rf Systems
Development of recirculating RF pulse compression system, 20:1576 (RA;JP;In Japanese)
RF control of ICR proton linac, 20:1556 (RA;JP;In Japanese)
RF system of FELI linac, 20:1565 (RA;JP;In Japanese)
Upgrade of the RF source for PF linac by pulse compression, 20:1575 (RA;JP;In Japanese)

Safety Analysis
Safety approach and engineered safety systems for the APT ^{3}He Target/Blanket System, 20:1694 (R;US)

Specifications
Induction linacs for heavy ion fusion, 20:2445 (R;US)

Standing Waves
Development of annular coupled structure, 20:1564 (RA;JP;In Japanese)

LINEAR COLLIDERS
Deep inelastic eγscattering, with beamsstrahlung, 20:1619 (RA;DE)
Experimental requirements for the study of electroweak gauge bosons, 20:1618 (RA;DE)
Machine, physics and detector (plus final focus) interplay at the next e^+e^- linear collider, 20:1620 (RA;DE)
Mode selective directional coupler for NLC, 20:1595 (R;US)

LIOUVILLE THEOREM
A covariant canonical description of Liouville field theory, 20:2067 (R;AU)

LIQUEFIED GASES
Release of propane under practice-oriented conditions - calculation of concentrations of gases with and without obstacles, 20:901 (R;DE;In German)

LIQUID CRYSTALS
Dynamics of phase ordering of nematics in a pore, 20:2299 (R;XA)

LIQUID EFFLUENTS
See LIQUID WASTES

LIQUID METAL COOLANT
See LIQUID METALS

LIQUID METAL TEST FACILITIES
See TEST FACILITIES

LIQUID METALS
The effect of a magnetic field on heat transfer in a slotted channel, 20:2429 (R;US)

LIQUID PHASE METHANATION PROCESS
See COAL GASIFICATION

LIQUID WASTES
See also WASTE WATER
A summary description of the flammable gas tank safety program, 20:411 (R;US)
Effect of gravitation on dynamic response of tanks containing two liquids, 20:220 (R;US)
K-Area acid/caustic basin groundwater monitoring report: First quarter 1994, 20:433 (R;US)
Liquid effluent/Hanford Environmental compliance FY 1995 Multi-Year Program Plan/Fiscal Year Work Plan, WBS 1.2.2.1 and 1.2.2.2, 20:428 (R;US)

LIQUIDS
See also COAL LIQUIDS
LIQUID CRYSTALS
LIQUID METALS
Numerical solution of the optimized random phase approximation, 20:1348 (R;XA)
Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)

LITHIUM
Thin flexible intercalation anodes, 20:899 (R;US)

LITHIUM 11
Limits on the window for halo phenomena, 20:2002 (R;FR)

LITHIUM 6 TARGET
Coherent and incoherent elastic proton scattering by ^{6} Li nucleus at intermediate energies., 20:2230 (R;UA)

LITHIUM ALLOYS
Summary of irradiation data on U-Al and Li-Al alloys, 20:153 (R;US)

LITHIUM COOLED REACTOR EXPERIMENT
See EXPERIMENTAL REACTORS

LITHIUM IODIDES
Simultaneous transport of synthetic colloids and a nonsorbing solute through single saturated natural fractures, 20:288 (R;US)

LMFBR TYPE REACTORS
One component, volume heated, boiling pool thermohydraulics, 20:790 (R;FR)

LOADING MACHINES (REACTOR)
See REACTOR CHARGING MACHINES

LOCA
See LOSS OF COOLANT

LOS ALAMOS MESON PHYSICS FACILITY
See LAMPF LINAC

LOS ALAMOS NATIONAL LABORATORY
See LANL

LOSS OF COOLANT
Assessment of CONTAIN and MELCOR for performing LOCA and LOVA analyses in ITER, 20:2437 (R;US)
On the prediction of flooding phenomenon with the Cathare code, 20:748 (R;FR)
Reactor elements properties response during a postulated loss-of-coolant accident (LOCA), 20:804 (R;EG)
Reflux condenser mode with non-condensible gas: assessment of Cathare against Bethsy test 7.2C, 20:759 (R;FR)
The top-down reflooding model in the Cathare code, 20:761 (R;FR)

LOSSES (PARTICLES)
See PARTICLE LOSSES

LOUISIANA
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)
Final Environmental Impact Statement for the construction and operation of Claiborne Enrichment Center, Homer, Louisiana (Docket No. 70-3-70): Volume 2, Public comments and NRC response, 20:150 (R;US)

LOVELACE BIOMEDICAL AND ENVIRONMENTAL RESEARCH INSTITUTE
See INHALATION TOXICOLOGY RESEARCH INSTITUTE
LOVIISA-1 REACTOR
Experience based reliability centered maintenance: An application on motor operated valve drives, 20:753 (R;FI)
Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1993 and annual summary, 20:751 (R;FI)
LOVIISA-2 REACTOR
Experience based reliability centered maintenance: An application on motor operated valve drives, 20:753 (R;FI)
Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1993 and annual summary, 20:751 (R;FI)
LOW ALLOY STEELS
See also STEEL-ASTM-A533
An update of corrosion inhibitors for mild steel exposed to 32-0-0 UAN solution, 20:1105 (R;US)
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)
LOW ENERGY ELECTRON DIFFRACTION
See ELECTRON DIFFRACTION
LOW-LEVEL RADIOACTIVE WASTES
Activity Levels
Operational management of very low level radioactive wastes: difficulties to elaborate a regulation device, 20:1909 (R;FR;In French)
Certification
Low-level waste certification plan for the WSCF Laboratory Complex, 20:335 (R;US)
Encapsulation
CEL Working procedures for WRAP 2A formulation development test, 20:362 (R;US)
Evaluation
Waste sampling and characterization facility (WSCF), 20:427 (R;US)
Ground Disposal
Buried waste integrated demonstration FY 94 deployment plan, 20:498 (R;US)
Minimization
Significant volume reduction of tank waste by selective crystallization: 1994 Annual report, 20:416 (R;US)
Mixing
Phase III (full scale) agitated mixing test plan, 20:363 (R;US)
Pipelines
Risk evaluation of embedded, single-walled liquid low-level waste piping at Oak Ridge National Laboratory: ESD Publication 4315, 20:246 (R;US)
Radiation Monitoring
Site environmental report: 1993, 20:501 (R;US)
Radioactive Waste Disposal
A process for establishing a financial assurance plan for LLW disposal facilities, 20:237 (R;US)
Benchmarking of computer codes and approaches for modeling exposure scenarios, 20:239 (R;US)
Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal, 20:236 (R;US)
Low level tank waste disposal study, 20:368 (R;US)
Performance assessment task team progress report, 20:238 (R;US)
Project report for the commercial disposal of mixed low-level waste debris, 20:260 (R;US)
Proposed waste form performance criteria and testing methods for low-level mixed waste, 20:240 (R;US)
Uranium geochemistry in soil and groundwater at the F and H seepage basins, 20:271 (R;US)
Use of engineered soils and other site modifications for low-level radioactive waste disposal, 20:1786 (R;US)
Radioactive Waste Processing
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)
Solid waste operations complex engineering verification program plan, 20:366 (R;US)
Waste Receiving and Processing Module 2A waste certification strategy, 20:361 (R;US)
Radioactive Waste Storage
Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste collection and transfer system upgrade for Building 3092 (central off-gas scrubber facility) at Oak Ridge National Laboratory, 20:245 (R;US)
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)
Sampling
Quality assurance program plan for low-level waste at the WSCF Laboratory, 20:337 (R;US)
Separation Processes
Enhanced sludge washing evaluation plan, 20:328 (R;US)
Solidification
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)
Storage Facilities
Design/Installation and Structural Integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory, 20:244 (R;US)
Waste sampling and characterization facility (WSCF), 20:427 (R;US)
Tanks
Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste collection and transfer system upgrade for Building 3092 (central off-gas scrubber facility) at Oak Ridge National Laboratory, 20:245 (R;US)
Underground Storage
Low-level waste vitrification plant environmental permitting plan, 20:405 (R;US)
Vitrification
Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)
Low level tank waste disposal study, 20:368 (R;US)
Low-level waste vitrification plant environmental permitting plan, 20:405 (R;US)
Radiological implications of contact maintenance: Impacts on facility design, 20:415 (R;US)
Selection of melter systems for the DOE/Industrial Center for Waste Vitrification Research, 20:431 (R;US)
LUBRICANTS
See also GREASES
Use of specific microorganisms for in-situ sanitation of long-standing pollution sites: Final report, 20:623 (R;DE;In German)
LUTETIUM 175 TARGET
The investigation of the cross sections of Po isotopes formation in the ^{27} Al + ^{175} Lu and ^{31} P + ^{169} Tm reactions, 20:2265 (R;XJ;In Russian)
LWR TYPE REACTORS
See WATER COOLED REACTORS
LYMPHOCYTES
Calcium antagonist, TMB-8, prevents the induction of adaptive response by hydrogen peroxide in human lymphocytes, 20:1919 (IA;PL)
LYMPHOID CELLS
See LYMPHOCYTES

M

M CODES
MBA acceptance test procedures, software Version 1.4, 20:566 (R;US)

Paradox applications integration ATP's for MAC and mass balance programs, 20:565 (R;US)
MA 754
See NICKEL BASE ALLOYS
MA 956
See IRON BASE ALLOYS
MAGIC NUCLEI
The bond structure of closed shells in condensed nuclear matter, 20:2208 (IA;AU)
MAGIC NUMBERS
See MAGIC NUCLEI
MAGNESIUM 20
Beta-decay of ^{20}Mg, 20:2227 (R;DE)
MAGNESIUM ALLOYS
An application of X-Ray computerized tomography for examining the internal features of materials, 20:2303 (IA;AU)
MAGNESIUM COMPOUNDS
See also MAGNESIUM HYDRIDES
MAGNESIUM OXIDES
MAGNESIUM PHOSPHATES
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)
MAGNESIUM HYDRIDES
Maximum entropy method study of the structure of Mg_2 Ni D_4 at 540 K using neutron diffraction data, 20:1188 (IA;AU)
MAGNESIUM OXIDES
In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory, 20:1237 (R;US)
MAGNESIUM PHOSPHATES
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)
MAGNET COILS
Joule heating of the ITER TF cold structure: Effects of vertical control coil currents and ELMS, 20:2431 (R;US)
MAGNETIC BREMSSTRAHLUNG
See SYNCHROTRON RADIATION
MAGNETIC COILS
See MAGNET COILS
MAGNETIC CONFINEMENT
Hybrid model in general geometry, 20:2405 (R;US)
[Coaxial Slow Source]: [Annual report, November 16, 1990–November 15, 1991], 20:2404 (R;US)
MAGNETIC FIELDS
ALS Multiple Trim Magnets, or "Magic Fingers," for insertion device field integral correction, 20:1591 (R;US)
Solutions of TEAM Problem No. 13 using integral equations in a sequential and parallel computing environment, 20:2524 (R;US)
MAGNETIC FLUX
Generalized relaxation theory and vortices in plasmas, 20:2009 (R;US)
MAGNETIC LEVITATED TRAINS
See LEVITATED TRAINS
MAGNETIC PROPERTIES
Magnetic properties of Er Co_{12} B_6:^{57} Fe, 20:1135 (IA;AU)
MAGNETIC SEPARATORS
Magnetic separation for environmental remediation, 20:503 (R;US)
MAGNETIC SPECTROMETERS
Development of the optical components of an alignment system for the muon spectrometer of the ATLAS detector, 20:1654 (R;DE;In German)
MAGNETIC VORTICES
See MAGNETIC FLUX
MAGNETITE
Mechanochemical transformation of hematite to magnetite: structural changes, 20:2318 (IA;AU)
MAGNETOHYDRODYNAMIC CHANNELS
See MHD CHANNELS
MAGNETOMETERS
Faraday magnetometer for studying interstitially modified ferromagnets, 20:2380 (IA;AU)
MAGNETOTELLURIC SURVEYS
Technological verification of geothermal exploration in 1992.: Development of fractured reservoir exploration and electromagnetic wave-utilizing exploration (development of array CSMT), 20:711 (I;JP;In Japanese)
MAGNEX PROCESS
See DESULFURIZATION
MAINTENANCE FACILITIES
200 Area weekly report, 20:167 (R;US)
MALIGNANCIES
See NEOPLASMS
MALNUTRITION
See NUTRITIONAL DEFICIENCY
MAMMALS
Toxicological benchmarks for wildlife: 1994 Revision, 20:457 (R;US)
MAMMARY GLANDS
Quality control handbook in mammography: Radiation Protection - Booklet 2, 20:1924 (R;NO;In Norwegian)
MAN
See also PERSONNEL
Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes, 20:494 (R;US)
MAN-MACHINE SYSTEMS
Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)
MANGANESE COMPOUNDS
See also MANGANESE SULFIDES
Two dimensional antiferromagnetic ordering in MnPS3, 20:1265 (IA;AU)
MANGANESE STEELS
Unirradiated material properties of Midland weld WF-70, 20:1161 (R;US)
MANGANESE SULFIDES
Spin glass behaviour in (Mn, Mg)S, 20:1270 (IA;AU)
MANHATTAN PROJECT
The Manhattan Project: Making the atomic bomb, 20:1692 (R;US)
MANIPULATORS
A review of technology for contact protection of remediation manipulators (WHC Issue 39), 20:513 (R;US)
Development and testing of a selvaging manipulator for yielding arch-support underground: Final report, 20:73 (I;DE;In German)
MANPOWER
Personnel requirements, 20:942 (R;US)
MANUFACTURING
See also COMPUTER-AIDED MANUFACTURING
Environmentally Conscious Manufacturing Project: Maine metal products association: [Quarterly] status report, July 1–September 30, 1994, 20:1039 (R;US)
MANUFACTURING FACILITIES
See INDUSTRIAL PLANTS
MANURES
Factors of influence relevant to ammonium release from liquid manure used as a basis for process-technical improvements, 20:1742 (I;DE;In German)
MANY-BODY PROBLEM
Many-body methods at finite temperature, 20:2213 (R;FR)
MARINE ECOSYSTEMS
See AQUATIC ECOSYSTEMS
MARVEL EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
MASS
Mass splitting of the pseudoscalar and vector mesons induced by the homogeneous vacuum gluon field, 20:2095 (R;XJ)
MASS SPECTROMETERS
Characterizing and imaging carcinogenic materials using ion beams and lasers: Progress report, 20:1949 (R;US)
Development of laser-ion beam photodissociation methods: Progress report, December 1991–November 1994, 20:1295 (R;US)

MASS SPECTROSCOPY
See also ICP MASS SPECTROSCOPY
Mass measurements of short-lived isotopes in traps and storage rings, 20:1630 (R;DE)
MASS TRANSFER
See also CONVECTION
ENVIRONMENTAL TRANSPORT
Determination of mass transfer coefficient in two-phase bubby flow using laser-doppler anemometry, 20:1474 (IA;GH)
MATERIAL BALANCE
Cleanup MAC and MBA code ATP, 20:2566 (R;US)
Conversion to Paradox 4.02 ATP's for MAC and mass balance programs, 20:564 (R;US)
MATERIALS
See also BIOLOGICAL MATERIALS
BUILDING MATERIALS
COMPOSITE MATERIALS
DIELECTRIC MATERIALS
DOPED MATERIALS
ENVIRONMENTAL MATERIALS
GRANULAR MATERIALS
HAZARDOUS MATERIALS
LASER MATERIALS
MATRIX MATERIALS
POROUS MATERIALS
RADIOACTIVE MATERIALS
RAW MATERIALS
REACTOR MATERIALS
SEALING MATERIALS
SEMICONDUCTOR MATERIALS
THERMOELECTRIC MATERIALS
THERMONUCLEAR REACTOR MATERIALS
On the sputtering of metals and insulators: A nonlinear evolution problem with nonlinear boundary condition, 20:2346 (R;US)
MATERIALS (ANTIFERROMAGNETIC)
See ANTIFERROMAGNETIC MATERIALS
MATERIALS (BIOLOGICAL)
See BIOLOGICAL MATERIALS
MATERIALS (BUILDING)
See BUILDING MATERIALS
MATERIALS (COMPOSITE)
See COMPOSITE MATERIALS
MATERIALS (DIELECTRIC)
See DIELECTRIC MATERIALS
MATERIALS (DOPED)
See DOPED MATERIALS
MATERIALS (ENVIRONMENTAL)
See ENVIRONMENTAL MATERIALS
MATERIALS (FERROELECTRIC)
See FERROELECTRIC MATERIALS
MATERIALS (FERROMAGNETIC)
See FERROMAGNETIC MATERIALS
MATERIALS (POROUS)
See POROUS MATERIALS
MATERIALS (SEMICONDUCTOR)
See SEMICONDUCTOR MATERIALS
MATERIALS HANDLING EQUIPMENT
See also CRANES
MIXERS
REMOTE HANDLING EQUIPMENT
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)
Test plan for the remote conveyance and innovative end effector demonstration, 20:269 (R;US)
MATERIALS TESTING
See also NONDESTRUCTIVE TESTING
Application of track autoradiography to determination of nitrogen distribution in surface layers of steels subjected to LPCVD and PVD processes and thermo-chemical treatment, 20:1485 (IA;PL)
Applications of synchrotron radiation to materials science and the Australian National Beamline Facility at the Photon Factory, 20:2338 (IA;AU)
Particle track membranes (PTM) examinations by small-angle X-ray scattering, 20:1486 (IA;PL)
Studies on the structure and properties of steel and ceramics surfaces modified by high intensity pulsed ion beams, 20:1484 (IA;PL)
MATERIALS WORKING
Directed light fabrication, 20:1155 (R;US)
MATHEMATICAL MANIFOLDS
Constraints, complex structures and quantization, 20:1999 (R;XJ)
Involutive co-distributions preserved by transitive families of vector fields, 20:2041 (R;XA)
MATHEMATICS
See also ALGEBRA
QMRPACK and applications, 20:2551 (R;US)
QMRPACK user's guide, 20:2553 (R;US)
MATRICES
A divide-and-conquer method for tridiagonalizing symmetric matrices with repeated eigenvalues, 20:2528 (R;US)
A framework for symmetric band reduction and tridiagonalization, 20:2529 (R;US)
A new Krylov-subspace method for symmetric indefinite linear systems, 20:2552 (R;US)
MATRIX MATERIALS
Carbon fiber reinforced superconductor composites: Final report, August 8, 1991–August 7, 1994, 20:1241 (R;US)
Gamma irradiation test report of simulated grout specimens for gas generation/liquid advection, 20:410 (R;US)
MAXIMUM CREDIBLE ACCIDENT
Effects on the surrounding population of postulated major accidents at the AAEC Research Establishment, 20:832 (R;AU)
MCA
See MAXIMUM CREDIBLE ACCIDENT
MCDOWELL-WELLMAN PROCESS
See COAL GASIFICATION
MEAN-FIELD THEORY
Relativistic mean field theory for unstable nuclei and its applications, 20:2055 (RA;JP;In Japanese)
MEASURING INSTRUMENTS
See also CALORIMETERS
DOSEMETERS
MAGNETOMETERS
MONITORS
RADIATION DETECTORS
RADIOMETRIC GAGES
SEISMIC ARRAYS
SPECTROPHOTOMETERS
THICKNESS GAGES
VISCOSIMETERS
241-SY-101 air lance removal lessons learned, 20:531 (R;US)
Development of a tester for evaluation of prototype thermal cells and batteries, 20:1674 (R;US)
LLNL/Lion Precision LVDT amplifier, 20:1511 (R;US)
Quarterly progress report, April 1, 1994–June 30, 1994, 20:1671 (R;US)
Software quality assurance plan for void fraction instrument, 20:408 (R;US)
Tank Monitor and Control System sensor acceptance test procedure: Revision 5, 20:372 (R;US)
Void fraction instrument acceptance test procedure, 20:1676 (R;US)
MECHANICAL EFFECTS
See MECHANICAL PROPERTIES
MECHANICAL FILTERS
Enviropower hot gas desulfurization pilot, 20:7 (R;US)
Test results from the Department of Energy's pressurized fluidized bed combustion hot gas cleanup program, 20:18 (R;US)
MECHANICAL PROPERTIES
See also CREEP
PLASTICITY
Implementation of a structural dependent model for the superalloy IN738LC in ABAQUS-code, 20:1147 (R;DE;In German)

MECHANICAL STRUCTURES
See also BRIDGES
SUPPORTS
Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)
Damage detection and health monitoring of operational structures, 20:1445 (R;US)
Engineering task plan for steam line ramp calculations, 20:399 (R;US)
SASSI system software configuration, 20:1454 (R;US)
Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)

MECHANICAL VIBRATIONS
Characterization of ignition overpressure using band limited temporal moments, 20:1683 (R;US)

MEDICAL PERSONNEL
See also RADIOLOGICAL PERSONNEL
Medical University of South Carolina Environmental Hazards Assessment Program annual report, July 1, 1993–June 30, 1994, 20:2448 (R;US)

MEETINGS
51st (Spring 1994) Meeting on Cryogenics and Superconductivity, 20:1074 (I;JP;In Japanese)
Fiscal 1993 investigational research on the development of a peat utilization mild gas production system, 20:47 (I;JP;In Japanese)
Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165), 20:1068 (I;JP;In Japanese)
Project for exchange of researchers concerned in petroleum substitution energy with EC countries, 20:904 (R;JP;In Japanese)

MELT REFINING PROCESS
See PYROCHEMICAL REPROCESSING

MEMBRANES
Advanced coal liquefaction to Pittsburgh Energy Technology Center: Quarterly report, April 1, 1994–June 30, 1994, 20:37 (R;US)
Ceramic membranes for methane conversion, 20:134 (R;US)
Chemical interactions between protein molecules and polymer membrane materials: Annual progress report, February 1, 1994–October 31, 1994, 20:1343 (R;US)
High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)
Particle track membranes (PTM) examinations by small-angle X-ray scattering, 20:1486 (IA;PL)
Some properties of foils and PTM made of different polymers irradiated by electrons, 20:598 (IA;PL)
The permeation of bis(2-fluoro-2,2-dinitroethyl) formal (FEFO), ethyl 4,4-dinitropentanoate (EDNP), ethyl 4-nitropentanoate (ENP), and 1,2,4-trichlorobenzene (TCB) through barrier membranes, 20:1688 (R;US)

MEMORY DEVICES
The National Storage Laboratory: Overview and status, 20:2560 (R;US)

MEMORY MANAGEMENT
The National Storage Laboratory: Overview and status, 20:2560 (R;US)

MERC PROCESS
See COAL GASIFICATION

MERCURY
Chloride and mercury monitors for air toxics measurements, 20:71 (R;US)
Mercury in shallow Savannah River Plant soil, 20:253 (R;US)
Mercury migration into ground water, a literature study, 20:1778 (R;US)
Tritium pumps which once contained mercury meet the RCRA definition of "empty container", 20:430 (R;US)

MERCURY HALIDES
See also MERCURY IODIDES
Investigation of ferro electricity in $(CH_3\ NH_3)HgCl_3$, 20:1266 (IA;AU)

MERCURY IODIDES
Mercuric iodide research and development in support of DOE Historically Black Colleges and University Program: Semiannual technical progress report, 20:1621 (R;US)

MESH GENERATION
Partitioning of unstructured meshes for load balancing, 20:2542 (R;FR)

MESOCRICETUS
See HAMSTERS

MESON FACTORIES
See also LAMPF LINAC
Multipole contribution from an off-axis orbit in an IR quadrupole and the consequences on the dynamic aperture, 20:1609 (R;US)

METAGALAXY
See UNIVERSE

METAL-NONMETAL BATTERIES
Nickel hydroxide electrodes in reduced-alkalinity electrolytes, 20:898 (R;US)

METALS
See also ACTINIDES
ALUMINIUM
GERMANIUM
LEAD
LIQUID METALS
MERCURY
RARE EARTHS
TRANSITION ELEMENTS
ZINC
Development of a relational database for rated values of metallic materials: Final report, 20:2570 (I;DE;In German)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994, 20:475 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
On the sputtering of metals and insulators: A nonlinear evolution problem with nonlinear boundary condition, 20:2346 (R;US)
Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes, 20:494 (R;US)
Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)
Unexpected observations in metals at very low temperatures, 20:2317 (IA;AU)
Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G, 20:543 (R;US)
Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)

METAMORPHIC ROCKS
Rb-Sr measurements on metamorphic rocks from the Barro Alto Complex, Goias, Brazil, 20:1301 (I;BR)

METEOROLOGY
Karlsruhe Nuclear Research Center, Institute for Meteorology and Climate Research. Progress report on research and development work in 1993, 20:1761 (R;DE;In German)
Workshop on climate database systems, 20:2567 (R;DE)

METHANE
Case studies of sewage treatment with recovery of energy from methane, 20:626 (R;US)
Ceramic membranes for methane conversion, 20:134 (R;US)
Emissions of greenhouse gases in the United States: 1987–1992, 20:1705 (R;US)
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Novel catalysts for methane activation: Quarterly report No. 3, April 1, 1993–June 30, 1993, 20:631 (R;US)
Novel catalysts for methane activation: Quarterly report No. 7, April 1, 1994–June 30, 1994, 20:632 (R;US)
Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)

Temporal evolution of turbulence/chemistry interactions in lifted, turbulent-jet flames, 20:1426 (R;US)

METHANOL FUELS
Pilot programme 'Methanol-derived fuel M100': Testing of methanol-fuelled MAN city buses in different German towns. Final report, 20:1088 (I;DE;In German)

METHYL BROMIDE
Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies, 20:1375 (R;US)

METHYL CHLORIDE
Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies, 20:1375 (R;US)

METHYL IODIDE
Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies, 20:1375 (R;US)

METHYL-FUEL
See ALCOHOLS

METROPOLITAN AREAS
See URBAN AREAS

MEXICO
Training for the qualification and competence of nuclear power plant personnel in Mexico, 20:2479 (RA;XA)

MHD CHANNELS
MHD-flow in slotted channels with conducting walls, 20:2430 (R;US)

MICHELSON INTERFEROMETER
Signal to noise improvements with a new Far-IR rapid-scan Michelson Interferometer, 20:1663 (R;US)

MICROBIAL FLORA
See MICROORGANISMS

MICROEARTHQUAKES
Subsurface fracture mapping using microearthquakes detected during primary oil production, Clinton County, Kentucky, 20:122 (R;US)

MICROELECTRONICS
Sub-half-micrometer device fabrication with synchrotron based X-ray lithography, 20:2314 (IA;JP;In Japanese)

MICROFLORA
See MICROORGANISMS

MICROORGANISMS
See also BACTERIA
The use of flow zytometry for microbiological analysis and assessing the performance of aerobic and anaerobic sewage works with the aim of biological process optimisation and control: Final report, 20:621 (R;DE;In German)

MICROPROCESSORS
Study of integrated circuits in natural space environment, 20:1659 (R;FR;In French)

MICROSCOPES
A study of mechanical processing damage in brittle materials: Progress report, 20:1670 (R;US)

MICROSCOPY
See also ACOUSTIC MICROSCOPY
ION MICROSCOPY
Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)

MICROSEISM
See SEISMIC NOISE

MICROSTRUCTURE
The micro pore structure of concrete determined by small angle neutron scattering, 20:2335 (IA;AU)

MICROWAVE AMPLIFIERS
Development status of an intense beam klystron, 20:1509 (R;US)

MICROWAVE EQUIPMENT
See also MICROWAVE AMPLIFIERS
SQUID DEVICES
Application of traveling-wave type RF window in L and S bands, 20:1579 (RA;JP;In Japanese)

MID-ATLANTIC REGION
See USA

MIDDLE EAST
See also EGYPTIAN ARAB REPUBLIC
Assistance to nuclear power user countries under the IAEA Technical Co-operation Programme, 20:2487 (RA;XA)

MIDLAND-1 REACTOR
Unirradiated material properties of Midland weld WF-70, 20:1161 (R;US)

MIDWEST REGION
See USA

MIGAS PROCESS
See COAL GASIFICATION

MIGRATION (RADIONUCLIDE)
See RADIONUCLIDE MIGRATION

MILITARY FACILITIES
Advances in technology for the construction of deep-underground facilities, 20:1677 (R;US)
Eielson Air Force Base operable unit 2 and other areas record of decision, 20:1829 (R;US)
Energy efficiency in military family housing: Inspection results, 20:1030 (R;US)
Navy radon assessment and mitigation program: Final report, 20:1740 (R;US)
Source evaluation report phase 2 investigation: Limited field investigation: Final report: United States Air Force Environmental Restoration Program, Eielson Air Force Base, Alaska, 20:1828 (R;US)

MILITARY PERSONNEL
Outline of an on-site inspection regime for conventional arms control in Europe, 20:1679 (R;US)

MILL TAILINGS
The Uranium Mill Tailings Remedial Action Project, 20:479 (RA;US)

MILROW EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

MINE-MOUTH GENERATING PLANTS
See FOSSIL-FUEL POWER PLANTS

MINERAL ACIDS
See INORGANIC ACIDS

MINERS
Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey, 20:1910 (RA;US)

MINING RESEARCH METHOD
See DESULFURIZATION

MIRRORS
Specification of the figure and finish of EUV mirrors in terms of performance requirements, 20:1428 (R;US)
Specification of the surface figure and finish of optical elements in terms of system performance, 20:1541 (R;US)

MISCIBILITY
See SOLUBILITY

MISGURNUS
See FISHES

MISSILES
Characterization of ignition overpressure using band limited temporal moments, 20:1683 (R;US)
Missile sizing for ascent-phase intercept, 20:1699 (R;US)

MISSOURI
Shallow groundwater investigations at Weldon Spring, Missouri: Final report for fiscal years 1988-1990, 20:1791 (R;US)

MITIGATION
Tenaska Washington II Generation Project: Tenaska Washington Partners II, L.P.: Mitigation Action Plan, 20:634 (R;US)

MIXED OXIDE FUEL FABRICATION PLANTS
Radiation shielding calculation for the MOX fuel fabrication plant Melox, 20:814 (R;FR)

MIXER-SETTLERS
200 Area weekly report, 20:173 (R;US)
MIXERS
DACS upgrade acceptance test procedure, 20:373 (R;US)
MM-0011
See NICKEL BASE ALLOYS
MOATA REACTOR
Effects on the surrounding population of postulated major accidents at the AAEC Research Establishment, 20:832 (R;AU)
MODELS (COSMOLOGICAL)
See COSMOLOGICAL MODELS
MODELS (CRYSTAL)
See CRYSTAL MODELS
MODERATORS
Weekly report - 100 Areas, 20:157 (R;US)
Weekly report - 100 Areas, 20:853 (R;US)
Weekly report - 100 Areas - April 14, 1955, 20:155 (R;US)
Weekly report - 100 Areas - March 10, 1955, 20:848 (R;US)
MODES (SINGLE-PARTICLE)
See SINGLE-PARTICLE MODES
MODULAR CONSTRUCTION
See MODULAR STRUCTURES
MODULAR STRUCTURES
Research on the power generation system with thermoelectric conversion elements, 20:1003 (R;JP;In Japanese)
MOISTURE
Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring, 20:289 (R;US)
MOLASSES
A low energy continuous reactor separator for the production of ethanol from corn grits/starch and biomass streams: 2nd Quarterly report, August 1–October 15, 1994, 20:620 (R;US)
MOLECULAR BIOLOGY
EPR studies of reduced Zn-chlorins and their isotope substituted analogs, 20:1904 (IA;PL)
MOLECULAR ORBITAL MODEL
See MOLECULES
MOLECULAR STRUCTURE
A neural network approach to the study of dynamics and structure of molecular systems, 20:2280 (R;US)
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)
MOLECULES
A neural network approach to the study of dynamics and structure of molecular systems, 20:2280 (R;US)
Potential-of-mean-force description of ionic interactions and structural hydration in biomolecular systems, 20:1868 (R;US)
MOLLUSCS
The EPR detectability levels in mollusc's shells exposed to the action of ionizing radiation, 20:1396 (IA;PL)
MOLTEN CARBONATE FUEL CELLS
Molten carbonate fuel cell product development test: Annual report, October 1992–September 1993, 20:1011 (R;US)
MOLTEN CARBONATE PROCESS
See DESULFURIZATION
MOLTEN SALT COOLED REACTORS
High-level assessment of LANL ABC Design, 20:788 (R;US)
MOLYBDENUM 99
LEU ^{99}Mo target fabrication and testing: Overview, status, and plans, 20:839 (R;US)
MOLYBDENUM BASE ALLOYS
Development of the next generation catalyst for coal direct liquefaction. 2, 20:45 (I;JP;In Japanese)
Model studies of hydrodesulfurization by Mo: The effect of promoters: Progress report, December 1, 1993–November 30, 1994, 20:1294 (R;US)
MONEL 400
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)
MONGOLIAN PEOPLES REPUBLIC
Preliminary investigation on Japan's cooperation with Mongolia for coal liquefaction technology, 20:46 (I;JP;In Japanese)
MONIQUE EVENT
See NUCLEAR EXPLOSIONS
MONITORED RETRIEVABLE STORAGE
Monitored retrievable storage facility conceptual design, 20:206 (RA;XA)
MONITORING (RADIATION)
See RADIATION MONITORING
MONITORS
See also BEAM MONITORS
WATER POLLUTION MONITORS
Fiber-optic sensors for rapid, inexpensive characterization of soil and ground water contamination, 20:1839 (R;US)
Test plan for core sampling drill bit temperature monitor, 20:534 (R;US)
MONITORS (BEAM)
See BEAM MONITORS
MONITORS (REACTOR)
See REACTOR CONTROL SYSTEMS
MONOCHROMATORS
A double monochromator system for a medium resolution neutron powder diffractometer, 20:1636 (IA;AU)
MONTAN WAXES
See WAXES
MONTE CARLO METHOD
Finite population-size effects in projection Monte Carlo methods, 20:1997 (R;FR)
MORGANTOWN ENERGY TECHNOLOGY CENTER
Jointly sponsored research program: Quarterly technical progress report, April–June, 1994, 20:927 (R;US)
MOS TRANSISTORS
Hydrogen incorporation and radiation induced dynamics in metal-oxide-silicon structures: A study using nuclear reaction analysis, 20:1660 (R;DE)
MOTOR VEHICLE ACCIDENTS
Proceedings of 1994 JSAE (Society of Automotive Engineers of Japan) Spring Convention (No.943 115-165), 20:1068 (I;JP;In Japanese)
MOTORCYCLES
Testing of low-emission motorcycles, 20:1084 (I;DE;In German)
MTX TOKAMAK
MTX final report, 20:2427 (R;US)
MULTIPHASE FLOW
Accurate solution algorithms for incompressible multiphase flows, 20:1476 (R;US)
Status of CFDLIB performance tests on the T3D, 20:1475 (R;US)
MULTIPLICITY
Universal features of multiplicity distributions, 20:2034 (R;US)
MULTIPROCESSING
See PARALLEL PROCESSING
MULTIWIRE DRIFT CHAMBERS
See DRIFT CHAMBERS
MULTIWIRE PROPORTIONAL CHAMBERS
See also DRIFT CHAMBERS
The track system of the modernized 'Hyperon' spectrometer, 20:1642 (R;XJ;In Russian)
MUNICIPAL WASTES
Compost preparation of agricultural and non-agricultural organic recyclings: Proceedings, 20:1057 (I;DE;In German)
MUNITIONS
See ORDNANCE
MUON BEAMS
Separated muon beams in the low-background laboratory of the JINR phasotron for studies involving the μSR-method, 20:1555 (R;XJ;In Russian)
MUON REACTIONS
Nuclear A dependence of exclusive vector meson production in muon scattering, 20:2237 (R;US)

MUON-ATOM COLLISIONS
Inelastic collisions of negative muons and hadrons with Helium metastable atoms, 20:2291 (R;XJ;In Russian)
Inelastic collisions of negative muons and hadrons with metastable hydrogen atoms, 20:2290 (R;XJ;In Russian)
MUON-NUCLEON INTERACTIONS
Recent results from E665, 20:2156 (R;US)
MUONIC ATOMS
Vacuum polarization effects in low-energy muonic atom collisions, 20:2289 (R;XJ)
MUSEUMS
See EDUCATIONAL FACILITIES
MWPC
See MULTIWIRE PROPORTIONAL CHAMBERS
MYCORRHIZAS
Reaction and interaction of mycorrhizae and rhizosphere, 20:1958 (IA;DE)

N

N-REACTOR
100-N technical manual: Volume 2A: Systems descriptions, 20:826 (R;US)
NAPHTHA
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992), 20:28 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993), 20:31 (R;US)
NATIONAL ENVIRONMENTAL POLICY ACT
See US NATIONAL ENVIRONMENTAL POLICY ACT
NATIONAL GOVERNMENT
Partnering with Sandia National Laboratories through alliances or consortia, 20:936 (R;US)
NATIONAL REACTOR TESTING STATION
See IDAHO NATIONAL ENGINEERING LABORATORY
NATIONAL SYNCHROTRON LIGHT SOURCE
See NSLS
NATURAL CIRCULATION
See NATURAL CONVECTION
NATURAL CONVECTION
Non-intrusive measurement of temperature and velocity in free convection, 20:1468 (I;DE;In German)
NATURAL GAS
Compiled Data
Winter fuels report, week ending October 28, 1994 (Contains glossary), 20:126 (R;US)
Winter fuels report: Week ending November 11, 1994, 20:972 (R;US)
Imports
Winter fuels report, 20:127 (R;US)
Information Systems
[Development of a gas information system (GASIS)]: Quarterly technical progress report, March 1994–May 1994, 20:135 (R;US)
Inventories
Natural gas monthly, October 1994, 20:136 (R;US)
Winter fuels report, 20:127 (R;US)
Production
Winter fuels report, 20:127 (R;US)
Research Programs
Institute for Petroleum Research. Annual report 1992, 20:984 (I;DE;In German)
Reserves
U.S. crude oil, natural gas, and natural gas liquids reserves - 1993 annual report, 20:101 (R;US)
Retail Prices
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
Statistical Data
Natural gas annual 1993, 20:137 (R;US)
Underground Storage
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
Wholesale Prices
Natural gas monthly, October 1994, 20:136 (R;US)
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
NATURAL GAS DEPOSITS
See also NATURAL GAS FIELDS
A novel geotechnical/geostatistical approach for exploration and production of natural gas from multiple geologic strata: Technical progress report, April–June, 1994, 20:131 (R;US)
Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas, 20:120 (R;US)
NATURAL GAS DISTRIBUTION SYSTEMS
Restructuring local distribution services: Possibilities and limitations, 20:138 (R;US)
NATURAL GAS FIELDS
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, January 1, 1994–March 31, 1994, 20:133 (R;US)
NATURAL GAS FUEL CELLS
A fuel cell overview, 20:1006 (R;US)
Molten carbonate fuel cell product development test: Annual report, October 1992–September 1993, 20:1011 (R;US)
NATURAL GAS GATHERING SYSTEMS
See NATURAL GAS DISTRIBUTION SYSTEMS
NATURAL GAS INDUSTRY
Annual report 1993 of the German Gas and Water Supply Acco-ciation (DVGW), 20:983 (I;DE;In German)
NATURAL GAS PROCESSING PLANTS
Sour gas plant subsurface remediation technology research and demonstration project: Quarterly technical progress report, January 1, 1994–March 31, 1994, 20:139 (R;US)
NATURAL GAS WELLS
A novel geotechnical/geostatistical approach for exploration and production of natural gas from multiple geologic strata: Technical progress report, April–June, 1994, 20:131 (R;US)
Completion history database - selective wells within the Bluebell field, Duchesne and Uintah Counties, 20:98 (R;US)
Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994, 20:128 (R;US)
NATURAL GASOLINE PLANTS
See NATURAL GAS PROCESSING PLANTS
NATURAL LIGHTING
See DAYLIGHTING
NATURAL RUBBER
Radiation vulcanization of natural rubber latex using N-butyl acrylate and carbon tetrachloride as sensitizer, 20:582 (IA;TH;In Thai)
The effect of proteins on the aging properties of radiation vulcanized natural rubber latex, 20:1381 (I;PH)
NAVIGATION
Automatic generation of fuzzy rules for the sensor-based navigation of a mobile robot, 20:1038 (R;US)
NAVIGATIONAL INSTRUMENTS
Roll control resonance test vehicle (RCRTV) system postflight evaluation report, 20:1034 (R;US)
NEGATIVE IONS
See ANIONS
NEGATONS
See ELECTRONS

NEGATRONS
See ELECTRONS
NEODYMIUM ALLOYS
A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
Structural and magnetic properties of Nd $Ni_{8.6-x}$ Fe_x $Si_{2.4}$, 20:1138 (IA;AU)
NEON 19
Beta-decay of ^{20}Mg, 20:2227 (R;DE)
NEON IONS
Observation of strong emission from NeIX and NeX transitions in a laser-driven plasma, 20:1510 (R;US)
NEOPLASMS
See also GLIOMAS
INEL BNCT Research Program Annual Report 1993, 20:1874 (R;US)
The application of nuclear technology in cancer radiotherapy, 20:1885 (IA;PL)
NEPA
See US NATIONAL ENVIRONMENTAL POLICY ACT
NEPTUNIUM COMPOUNDS
Thermodynamic modeling of neptunium(V) solubility in concentrated Na-CO_3-HCO_3-Cl-ClO_4-H-OH-H_2O systems, 20:315 (R;US)
NEPTUNIUM ISOTOPES
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)
NERVOUS SYSTEM DISEASES
Migrational disorders: a review of 13 cases. Computed tomography and Magnetic resonance imaging, 20:1876 (I;BR;In Portuguese)
Radiopharmaceuticals for diagnosis: Final report, 20:1873 (R;US)
NETWORKS (COMPUTER)
See COMPUTER NETWORKS
NEURAL NETWORKS
A survey of artificial neural network applications in flow analysis of energy networks, 20:2546 (R;US)
Learning algorithms for feedforward networks based on finite samples, 20:2554 (R;US)
Utilizing artificial neural networks in netwsork flow analysis: An annotated bibliography, 20:2547 (R;US)
NEUROSPORA
Large scale solubilization of coal and bioconversion to utilizable energy: Technical progress report, July 1, 1994–September 30, 1994, fourth quarterly, 20:41 (R;US)
NEUTRINOS
See also ELECTRON NEUTRINOS
SOLAR NEUTRINOS
TAU NEUTRINOS
The laboratory and astrophysical constraints on the neutrino charge radius, 20:2197 (R;FR)
NEUTRON ACTIVATION ANALYSIS
A trail of computer simulation of semiconductor detector gamma-ray spectra for detectability and precision prediction in instrumental neutron activation analysis, 20:1321 (IA;PL)
Determination of antimony in natural waters by neutron activation analysis after separation on a chelating sorbent, 20:1322 (IA;PL)
Elaboration of the universal method of radiochemical separation of molybdenum from irradiated biological samples for NAA purposes, 20:1323 (IA;PL)
Identification of 16. century paintings of the Malopolska School by means of IRNAA, 20:1314 (IA;PL)
Non destructive characterization using pulsed fast-thermal neutrons, 20:1293 (R;US)
The elaboration of the method of phosphorus and potassium determination in plant materials with the use of 14 MeV neutron generator in the new constructed laboratory dedicated for nitrogen determinations, 20:1324 (IA;PL)
NEUTRON BEAMS
Anomalous time-decay in neutron depolarization by high-Tc superconductors, 20:2375 (IA;AU)
NEUTRON CAPTURE
See NEUTRON REACTIONS
NEUTRON CAPTURE THERAPY
A 2.5 MeV electrostatic quadrupole dc accelerator for BNCT application, 20:1890 (R;US)
Design of neutron beams at the Argonne Continuous Wave Linac (ACWL) for boron neutron capture therapy and neutron radiography, 20:1871 (R;US)
Neutron therapy and medical therapy reactor, 20:1879 (IA;JP;In Japanese)
NEUTRON DIFFRACTION
Maximum entropy method study of the structure of Mg_2 Ni D_4 at 540 K using neutron diffraction data, 20:1188 (IA;AU)
NEUTRON DIFFRACTOMETERS
A double monochromator system for a medium resolution neutron powder diffractometer, 20:1636 (IA;AU)
NEUTRON DIFFUSION EQUATION
Error analysis of the quadratic nodal expansion method in slab geometry, 20:2277 (R;US)
NESTLE: Few-group neutron diffusion equation solver utilizing the nodal expansion method for eigenvalue, adjoint, fixed-source steady-state and transient problems, 20:801 (R;US)
NEUTRON DOSIMETRY
Some aspects on neutron dosimetry, 20:1615 (R;EG)
NEUTRON GENERATORS
Neutron Generator/Switch Tube (NG/ST) prototyping relocation environmental assessment, 20:450 (R;US)
NEUTRON MATTER
See NUCLEAR MATTER
NEUTRON REACTIONS
New thermal neutron scattering files for ENDF/B-VI release 2, 20:2266 (R;US)
NEUTRON SOURCE FACILITIES
An examination of the elastic structural response of the Advanced Neutron Source fuel plates, 20:607 (R;US)
NEUTRON SOURCES
See also NEUTRON GENERATORS
Design of neutron beams at the Argonne Continuous Wave Linac (ACWL) for boron neutron capture therapy and neutron radiography, 20:1871 (R;US)
NEUTRON SPECTROSCOPY
Neutron spectroscopy studies of amino-acids, 20:2340 (IA;PL)
NEUTRON STARS
Asymmetric nuclear matter and neutron star properties, 20:2223 (R;NO)
NEUTRONS
See also THERMAL NEUTRONS
Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993, 20:2221 (R;US)
NEVADA TEST SITE
Status of the flora and fauna on the Nevada Test Site, 1993: Results of continuing basic environmental monitoring, January through December 1993, 20:1789 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1, 20:241 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)
NEW ENGLAND
See USA
NEW MEXICO
An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)
Tensor controlled-source audiomagnetotelluric survey over the Sulphur Springs Thermal area, Valles Caldera, New Mexico, U.S.A.; Implication for structure of the western Caldera and for CSAMT methodology, 20:1779 (R;US)
NEW YORK
Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V), 20:504 (R;US)
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)

NICKEL
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Magnetization and magnetostriction in highly magnetostrictive materials, 20:1145 (R;US)
Molecular dynamics simulation of ion impact phenomena in 3 D nickel lattice, 20:2350 (IA;AU)

NICKEL 58
Ion beam mixing of isotopic bilayers, 20:1136 (IA;AU)

NICKEL 60
Ion beam mixing of isotopic bilayers, 20:1136 (IA;AU)

NICKEL ALLOYS
See also CHROMIUM-NICKEL STEELS
NICKEL BASE ALLOYS
Computational modeling of diffusion-controlled transformations in ternary systems, 20:1106 (R;US)
Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Structural and magnetic properties of Nd $Ni_{8.6-x}$ Fe_x $Si_{2.4}$, 20:1138 (IA;AU)

NICKEL BASE ALLOYS
See also HASTELLOYS
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)
Static corrosion of construction materials exposed to superphosphoric acid made from various sources of phosphate rock, 20:1104 (R;US)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)

NICKEL COMPOUNDS
Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report, 20:1362 (I;DE;In German)
Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)
Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)

NICKEL-CADMIUM BATTERIES
Composition and cycle life of multicomponent AB_5 hydride electrodes, 20:895 (R;US)

NIGERIA
Predicting the components of the total hemispherical solar radiation from sunshine duration measurements in Lagos, Nigeria, 20:641 (R;XA)

NIOBIUM ALLOYS
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)

NIOBIUM NITRIDES
Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)

NITRATES
See also ALUMINIUM NITRATES
SILVER NITRATES
SODIUM NITRATES
URANYL NITRATES
Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)
Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)
Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)
Nitrate analysis of snow and ice core samples collected in the vicinity of a waste detonation event, McMurdo Station, Antarctica, 20:1792 (R;US)
Site environmental report: 1993, 20:501 (R;US)

NITRIC OXIDE
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)

NITRITES
Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)

NITRO COMPOUNDS
Thermal decomposition reactions of HMX and RDX and their importance in predicting cookoff hazards, 20:1689 (R;US)

NITROGEN
Nitrogen accumulation profiles of selected grain and vegetable crops: A bibliography (1940-1992), 20:1870 (R;US)
Nitrogen control of chloroplast differentiation, 20:1894 (R;US)
Synthetic waste chemical mechanism studies, 20:330 (R;US)
Tribology and surface mechanical properties of excimer laser nitrided titanium, 20:1158 (R;US)

NITROGEN DIOXIDE
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Reactions of tree species to air pollutants under controlled conditions, 20:1961 (IA;DE;In German)

NITROGEN NITRIDES
See NITROGEN

NITROGEN OXIDES
See also NITRIC OXIDE
NITROGEN DIOXIDE
NITROUS OXIDE
180 MW demonstration of advanced tangentially-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers: Technical progress report, Third quarter 1992, 20:86 (R;US)
180 MW demonstration of advanced tangentially-fired combustion techniques for the reduction of nitrogen oxide (NOx) emissions from coal-fired boilers: Technical progress report, First quarter 1991, 20:85 (R;US)
500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide emissions from coal-fired boilers, 20:80 (R;US)
500 MW demonstration of advanced wall-fired combustion techniques for the reduction of nitrogen oxide (NO_x) emissions from coal-fired boilers: Technical progress report, fourth quarter 1993, 20:84 (R;US)
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)
Emissions of greenhouse gases in the United States: 1987–1992, 20:1705 (R;US)
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994, 20:738 (R;US)
IGR NO_x/SO_x control technology: [Progress report], April 1–June 30, 1994, 20:736 (R;US)
Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1993–June 30, 1993, 20:65 (R;US)
Reducing nitrogen oxides in exhaust gases by means of urea. Final report, 20:1087 (R;CH;In German)
Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica, 20:1750 (R;US)

Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)

NITROUS OXIDE
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Synthetic waste chemical mechanism studies, 20:330 (R;US)

NMR
See NUCLEAR MAGNETIC RESONANCE

NMR SPECTRA
Elimination of multiple quantum artifacts in 2D COSY NMR spectra (EMA-COSY), 20:2284 (IA;AU)

NO. 2 FUEL OIL
See HEATING OILS

NOBLE GASES
See RARE GASES

NON-EQUILIBRIUM PLASMA
Dynamics of structure formation in nonequilibrium systems (Wave Media), 20:2413 (R;UA;In Russian)

NON-PROLIFERATION POLICY
NPT safeguards and the peaceful use of nuclear energy, 20:946 (I;XA)

NON-PROLIFERATION TREATY
Airborne Multisensor Pod System (AMPS) data access concept, 20:970 (R;US)
Director's series on proliferation, 20:1098 (R;US)

NONAXIAL NUCLEI
See DEFORMED NUCLEI

NONDESTRUCTIVE TESTING
A comparison of real-time radiography results and visual characterization results with emphasis on WIPP WAC and TRAMPAC compliance issues, 20:255 (R;US)

NONLINEAR PROBLEMS
COYOTE II - a finite element computer program for nonlinear heat conduction problems: Part I - theoretical background, 20:1477 (R;US)
On the sputtering of metals and insulators: A nonlinear evolution problem with nonlinear boundary condition, 20:2346 (R;US)

NONLINEAR SYSTEMS
See NONLINEAR PROBLEMS

NONRADIOACTIVE WASTES
See also CHEMICAL WASTES
616 Nonradioactive Dangerous Waste Storage Facility – Essential/support drawing list: Revision 2, 20:414 (R;US)
Hanford Site ground-water monitoring for 1993, 20:466 (R;US)

NORTH KOREA
Communication dated 14 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:552 (R;XA;In Arabic, Chinese, English, French)
Communication dated 20 April 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:574 (R;XA;In Arabic, Chinese, English, French)
Communication dated 24 March 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:571 (R;XA;In Arabic, Chinese, English, French)
Communication dated 3 June 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:577 (R;XA;In Arabic, Chinese, English, French)
Communication dated 3 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:551 (R;XA;In Arabic, Chinese, English, French)
Communication dated 4 April 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:572 (R;XA;In Arabic, Chinese, English, French)
Communications dated 27 and 28 May 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:553 (R;XA;In Arabic, Chinese, English, French)
Statement dated 1 June 1994 by a spokesman for the Foreign Ministry of the Democratic People's Republic of Korea, 20:575 (R;XA;In Arabic, Chinese, English, French)

NORTHERN IRELAND
See UNITED KINGDOM

NPR REACTOR
See N-REACTOR

NRTS
See IDAHO NATIONAL ENGINEERING LABORATORY

NSLS
Specification of the surface figure and finish of optical elements in terms of system performance, 20:1541 (R;US)

NSRR REACTOR
Behavior of pre-irradiated fuel under a simulated RIA condition: Results of NSRR test JM-3, 20:817 (R;JP)

NUCLEAR ATTACKS
See NUCLEAR WEAPONS

NUCLEAR CHEMISTRY
Annual report 1992, 20:1418 (I;PL)
Mainz University, Institute of Nuclear Chemistry. Annual report 1993, 20:1412 (I;DE;In German)
Summer schools in nuclear chemistry: Final progress report, February 15, 1991–February 14, 1992, 20:1410 (R;US)

NUCLEAR CONTROVERSY
See HUMAN POPULATIONS

NUCLEAR DATA COLLECTIONS
Assessment of the current status of basic nuclear data compilations, 20:2202 (R;US)
Index of nuclear data libraries available from the IAEA Nuclear Data Section, 20:2571 (R;XA)

NUCLEAR DECAY
See also BETA DECAY
GAMMA DECAY
Mass model for unstable nuclei, 20:2219 (RA;JP)

NUCLEAR ENERGY
Coordinated Research Programs
Nuclear energy research until 2000: The necessity of the nuclear energy research until the year 2000 and a proposal for the organizational model of the research, 20:2515 (R;FI;In Finnish)
Economic Analysis
Nuclear power. Status and development trends, 20:963 (IA;PL)
Environmental Impacts
Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)
Federal Republic Of Germany
Nuclear power in Germany, 20:968 (IA;PL)
Finland
Nuclear power in Finland. Present status and trends, 20:969 (IA;PL)
Meetings
Nuclear energy and natural environment. Information seminar, 20:587 (I;PL)
Public Information
Development of nuclear energy and nuclear policy in China, 20:955 (I;XA)
Mass media and nuclear energy - IAEA's role, 20:959 (I;XA)
Nuclear development in Korea, 20:947 (I;XA)
Nuclear information and education experience in Canada, 20:952 (I;XA)
Nuclear techniques in agriculture and industry in China, 20:954 (I;XA)
Opening remarks, 20:949 (I;XA)
Public information and education in Canada, 20:944 (I;XA)
Welcome remarks (Regional seminar on nuclear energy, a new energy for development.), 20:950 (I;XA)
Public Opinion
Nuclear information and education experience in Canada, 20:952 (I;XA)
Public information and education in Canada, 20:944 (I;XA)
Welcome remarks (Regional seminar on nuclear energy, a new energy for development.), 20:950 (I;XA)
Resource Development
Nuclear power. Status and development trends, 20:963 (IA;PL)

Russian Federation
Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)
Socio-Economic Factors
Nuclear energy and the natural environment, 20:1884 (IA;PL)
Ukraine
Nuclear energy in Ukraine. State and problems, 20:967 (IA;PL)

NUCLEAR EXPLOSIONS
CTBT technical issues handbook, 20:1099 (R;US)
Historical sketches of Sandia National Laboratories nuclear field testing: Volume 1: Full discussion except for sensitive references, 20:1695 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 1, 20:1690 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 2, 20:1691 (R;US)

NUCLEAR FACILITIES
See also FEED MATERIALS PLANTS
FUEL FABRICATION PLANTS
FUEL REPROCESSING PLANTS
NUCLEAR POWER PLANTS
RADIOACTIVE WASTE FACILITIES
SURPLUS NUCLEAR FACILITIES
Confinement
Confinements systems in nuclear facilities other than nuclear reactors, 20:805 (R;EG)
Decommissioning
Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
Transition projects FY 1995 multi-year program/fiscal year work plan WBS 1.3.1. and 7.1, 20:538 (R;US)
Decontamination
Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
Transition projects FY 1995 multi-year program/fiscal year work plan WBS 1.3.1. and 7.1, 20:538 (R;US)
Inspection
Team leader's preparation guide for Operational Readiness Reviews (ORR), 20:2456 (R;US)
The International Remote Monitoring Project and implications, 20:561 (R;US)
Materials Handling Equipment
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
Monitoring
The International Remote Monitoring Project and implications, 20:561 (R;US)
Pollution
Toxicological benchmarks for wildlife: 1994 Revision, 20:457 (R;US)
Radioactive Waste Management
Performance indicators for 2nd quarter CY 1994, 20:497 (R;US)
Reactor Dismantling
Gamma camera prototype for nuclear installation dismantling, 20:741 (R;FR;In French)
Regulations
Waste management regulatory compliance issues related to D&D activities at Oak Ridge National Laboratory (ORNL), 20:225 (R;US)
Remedial Action
Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
Risk Assessment
Hanford Generic Interim Safety Basis, 20:341 (R;US)
Safety Analysis
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
Hanford Generic Interim Safety Basis, 20:341 (R;US)
Performance indicators for 2nd quarter CY 1994, 20:497 (R;US)
Site Approvals
Idaho National Engineering Laboratory site development plan, 20:1782 (R;US)
Surface Contamination
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)
Surveillance
Safeguards equipment of the future integrated monitoring systems and remote monitoring, 20:560 (R;US)
Training
Training Accreditation Program Standard: Requirements and Guidelines, 20:2458 (R;US)
Training Program Handbook: A systematic approach to training, 20:2455 (R;US)

NUCLEAR FUEL ELEMENTS
See FUEL ELEMENTS

NUCLEAR FUELS
See also SPENT FUELS
Nuclear fuel cycles : description, demand and supply estimates, 20:795 (R;EG)
Quality control in nuclear fuel fabrication, 20:146 (R;EG)

NUCLEAR INDUSTRY
Interregional and regional training courses 1994, 20:2488 (RA;XA)

NUCLEAR MAGNETIC RESONANCE
Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules, 20:1390 (IA;PL)

NUCLEAR MATERIALS MANAGEMENT
Agreement with the Government of India for the application of safeguards to all nuclear material subject to Agency safeguards under INFCIRC/154, Part 1 and under the Agreements between India and the IAEA contained in exchanges of letters dated 1 October and 1 December 1993, 20:570 (R;XA;In Arabic, Chinese, English, French)
Communications dated 2 and 6 June 1994 received from the Permanent Mission of the Democratic People's Republic of Korea to the International Atomic Energy Agency, 20:576 (R;XA;In Arabic, Chinese, English, French)
Communications received from Member States regarding guidelines for the export of nuclear material, equipment and technology, 20:569 (R;XA;In Arabic, Chinese, English, French)
Communications received from Members regarding the export of nuclear material and of certain categories of equipment and other material, 20:550 (R;XA;In Arabic, Chinese, English, French)
Initial tank calibration at NUCEF critical facility. 2: Data analysis, 20:1439 (R;JP;In Japanese)
Paradox applications integration ATP's for MAC and mass balance programs, 20:565 (R;US)
Security Transition Program Office (STPO), technology transfer of the STPO process, tools, and techniques, 20:549 (R;US)

NUCLEAR MATERIALS POSSESSION
Lidar technologies for airborne and space-based applications, 20:1666 (R;US)
The International Remote Monitoring Project and implications, 20:561 (R;US)

NUCLEAR MATTER
Asymmetric nuclear matter and neutron star properties, 20:2223 (R;NO)
Fermion damping rate in a hot medium, 20:2207 (R;DE)
Nuclear matter equation of state with effects of excluded volume., 20:2218 (R;UA)

NUCLEAR MEDICINE
Nuclear techniques in agriculture and industry in China, 20:954 (I;XA)

NUCLEAR PHYSICS
Section for nuclear physics and energy physics - Annual report: January 1 - December 31, 1993, 20:2517 (R;NO)

NUCLEAR POTENTIAL
Pauli blocking and internucleus potential effects on total reaction cross section, 20:2256 (RA;JP;In Japanese)

NUCLEAR POWER
Benefits of nuclear power in a developing country. Nuclear power development policy in Korea, 20:956 (I;XA)

Current status of SMPRs and manpower development for nuclear power, 20:798 (I;LK)
Interregional and regional training courses 1994, 20:2488 (RA;XA)
Net energy analysis of different electricity generation systems, 20:796 (R;XA)
Nuclear information and education experience in the United Kingdom, 20:960 (I;XA)
Nuclear power - status and development 1994, 20:797 (R;NO;In Norwegian)
Nuclear power. Status and development trends, 20:963 (IA;PL)
Public acceptance (PA) activities of nuclear power in Japan, 20:948 (I;XA)
Public information and education in England, 20:945 (I;XA)
The energy issue in Sweden. Can society handle technology poorly understood by its citizens?, 20:964 (IA;PL)
[Technical Cooperation programmes organized by Division of Nuclear Power], 20:2489 (RA;XA)

NUCLEAR POWER PLANTS
Current status of SMPRs and manpower development for nuclear power, 20:798 (I;LK)

After-Heat
Principles of decay heat removal in reactor technology - Present status and future prospects, 20:744 (RA;XA)

Aging
Research on U.S. nuclear power plant major equipment aging, 20:883 (R;US)

Alarm Systems
Human factors engineering guidance for the review of advanced alarm systems, 20:830 (R;US)

Cernavoda-1 Reactor
Cernavoda NPP operations training programs, 20:2505 (RA;XA)

Construction
Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)

Data Acquisition Systems
Guidelines for multipurpose data systems for nuclear power plants, 20:743 (R;XA)

Diagnostic Techniques
Cooperative research and development for artificial intelligence based reactor diagnostic system, 20:820 (R;US)

Economics
Current status of nuclear power development, 20:962 (I;LK)

Electrical Equipment
An evaluation of the fire barrier system thermo-lag 330-1, 20:812 (R;US)

Environmental Impacts
Development of nuclear power in Sweden, 20:965 (IA;PL)

Failure Mode Analysis
Events in time: Basic analysis of Poisson data, 20:803 (R;US)
Hits per trial: Basic analysis of binomial data, 20:802 (R;US)

Failures
Survey of reportable events in nuclear power plants in the Federal Republic of Germany. Period covered: 2nd quarter 1994, 20:873 (I;DE;In German)

Human Factors Engineering
Local control stations: Human engineering issues and insights, 20:831 (R;US)

Pressure Vessels
Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)

Reactor Monitoring Systems
Cooperative research and development for artificial intelligence based reactor diagnostic system, 20:820 (R;US)

Reactor Safety
Trends in safety criteria for future reactor plants, 20:745 (RA;XA)

Real Time Systems
The Plant-Window system: A flexible, expandable computing environment for the integration of power plant activities, 20:806 (R;US)

Risk Assessment
The tolerability of risk from nuclear power stations, 20:746 (I;CZ;In Czech)

Safety
Current status of nuclear power development, 20:962 (I;LK)
IAEA programmes on the safety of nuclear power plants in Easter Europe and countries of the former Soviet Union, 20:2493 (RA;XA)
Research on U.S. nuclear power plant major equipment aging, 20:883 (R;US)

Scientific Personnel
Training of nuclear power plant personnel in Canada, 20:2497 (RA;XA)

Sweden
Development of nuclear power in Sweden, 20:965 (IA;PL)

Switzerland
Summary of operating experience in Swiss nuclear power plants 1993, 20:800 (I;CH)

Training
Description of training activities and re-training system for nuclear professionals at the Paks Nuclear Power Plant, Hungary, 20:2502 (RA;XA)
ENIKO MIFI theses for discussion on implementation of training assistance, 20:2507 (RA;XA)
IAEA activities in nuclear power plant personnel training and qualification, 20:2490 (RA;XA)
Information on the projects of technical assistance in personnel training for Russian NPPS. Presentation of Russia, 20:2506 (RA;XA)
Presentation of Germany, 20:2501 (RA;XA)
System of NPP personnel training in Slovak Republic, 20:2508 (RA;XA)
Tecnatom training program. Presentation of Spain, 20:2509 (RA;XA)
The Czech Republic programme and experiences on training and qualification for NPPs personnel, 20:2499 (RA;XA)
Training and qualification of NPP personnel in Romania, 20:2504 (RA;XA)
Training-related infrastructure development and evaluation of training performance, 20:2491 (RA;XA)

Ukraine
Nuclear energy in Ukraine. State and problems, 20:967 (IA;PL)

NUCLEAR POWER STATIONS
See NUCLEAR POWER PLANTS

NUCLEAR PROPERTIES
Nuclear moments of transitional nuclei in the vicinity of Z=40 and Z=82 shells, 20:2222 (R;FR;In French)

NUCLEAR REACTION ANALYSIS
The new nuclear microprobe at Livermore, 20:1336 (R;US)

NUCLEAR REACTIONS
Regge theory inspired model on nuclear destruction in high energy nucleus-nucleus interactions, 20:2231 (R;XJ)

NUCLEAR REACTORS
See REACTORS

NUCLEAR SAFETY
See RADIATION PROTECTION

NUCLEAR SAFETY RESEARCH REACTOR (JAPAN)
See NSRR REACTOR

NUCLEAR SPIN RESONANCE
See NUCLEAR MAGNETIC RESONANCE

NUCLEAR STRUCTURE
Hadronic physics with multi-GeV electrons, 20:2214 (R;FR)
Robust predictions of the interacting boson model, 20:2205 (R;US)
Universal correlations of collective observables: Empirical phenomenology and model interpretations, 20:2203 (R;US)

NUCLEAR TRANSMUTATION
See TRANSMUTATION

NUCLEAR WASTES
See RADIOACTIVE WASTES

NUCLEAR WEAPON TESTS
See NUCLEAR EXPLOSIONS

NUCLEAR WEAPONS
Arms control and nonproliferation technologies, third quarter 1994: Dismantlement transparency, 20:547 (R;US)
Non destructive characterization using pulsed fast-thermal neutrons, 20:1293 (R;US)

Piercing tool, Transportation Accident Resistant Container (TARC), 20:1449 (R;US)

NUCLEAR WEAPONS DISMANTLEMENT
Advanced pyrochemical technologies for minimizing nuclear waste, 20:321 (R;US)
Arms control and nonproliferation technologies, third quarter 1994: Dismantlement transparency, 20:547 (R;US)
Base hydrolysis and hydrothermal processing of PBX-9404, 20:291 (R;US)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)

NUCLEATION
Bubble nucleation rates in first-order phase transitions, 20:2020 (R;FR)
Low pressure growth of diamond films, 20:1182 (IA;AU)
The initial thermo-instability of the Al-Cu-Mg-Ag supersaturated solid solution, 20:1125 (IA;AU)

NUCLEIC ACIDS
See also DNA
Potential-of-mean-force description of ionic interactions and structural hydration in biomolecular systems, 20:1868 (R;US)

NUCLEOGENESIS
See NUCLEOSYNTHESIS

NUCLEONS
See also NEUTRONS
PROTONS
Nuclear research with the electromagnetic probe: Final progress report, 20:2190 (R;US)
Two-nucleon and meson-two-nucleon systems at intermediate energies, 20:2167 (RA;JP)

NUCLEOSYNTHESIS
Can the electric charges of elementary particles change with time?, 20:2200 (R;AU)

NUTRITION
Modelling nutrition and growth in pollution research, 20:1966 (IA;DE)

NUTRITIONAL DEFICIENCY
Modelling nutrition and growth in pollution research, 20:1966 (IA;DE)

NUTS (MECHANICAL)
See FASTENERS

O

OAK RIDGE NATIONAL LABORATORY
See ORNL

OAK RIDGE RESERVATION
Design/Installation and Structural Integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory, 20:244 (R;US)
Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
Oak Ridge background soils project provides data for remedial action evaluation, 20:224 (R;US)
The February 21, 1993 tornadoes of East Tennessee, 20:544 (R;US)
Work plan for the treatability study for PCB dehalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:1790 (R;US)

OCCUPATIONAL EXPOSURE
Nuclear power industry - activity discharges - occupational exposures. 1993, 20:1946 (R;SE;In Swedish)
Radiation in everyday life, 20:961 (I;XA)

OCCUPATIONAL SAFETY
Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:506 (R;US)

OCEANS
See SEAS

OFFICE BUILDINGS
Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0, 20:1020 (R;US)

OIL FURNACES
Development and testing of a high efficiency advanced coal combustor: Phase III Industrial boiler retrofit: Quarterly technical progress report number 10, January 1–March 31, 1994, 20:88 (R;US)

OIL SHALE WASTE WATER
See OIL SHALES
WASTE WATER

OIL SHALES
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
The development of an integrated multistage fluid-bed retorting process: Quarterly report, April–June, 1994, 20:140 (R;US)

OIL SPILL FINGERPRINTING
See OIL SPILLS

OIL SPILLS
Design, construction and testing of a rotary kiln for the thermal treatment of contaminated soils: Final report, 20:129 (I;DE;In German)
Site-specific standard request for Underground Storage Tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility Buildings 9754-1 and 9720-15, 20:545 (R;US)

OIL WELLS
An evaluation of known remaining oil resources in the United States: Appendix, Project on Advanced Oil Recovery and the States, 20:106 (R;US)
An evaluation of known remaining oil resources in the United States: Project on advanced oil recovery and the states: Volume 1, 20:107 (R;US)
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)
An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)
Application of integrated reservoir management and reservoir characterization to optimize infill drilling: Quarterly technical progress report, June 13, 1994–September 12, 1994, 20:118 (R;US)
Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Quarterly status report (final), April 1, 1994–June 31, 1994, 20:111 (R;US)
Completion history database - selective wells within the Bluebell field, Duchesne and Uintah Counties, 20:98 (R;US)
Development of a cost effective environmental compliance technology of stripper brine wells: [Quarterly report], April 1, 1994–June 30, 1994, 20:128 (R;US)
Improved techniques for fluid diversion in oil recovery: Quarterly technical progress report, July 1, 1994–September 30, 1994, 20:114 (R;US)
Modification of chemical and physical factors in steamflood to increase heavy oil recovery: Annual report, October 1, 1992–September 30, 1993, 20:115 (R;US)
Productivity and injectivity of horizontal wells: Annual report, March 10, 1993–March 9, 1994, 20:113 (R;US)
West Hackberry Tertiary Project annual technical progress report, September 3, 1993–September 2, 1994, 20:117 (R;US)

OILS
See also PYROLYTIC OILS
VEGETABLE OILS
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)

OKLAHOMA
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)

OKLO PHENOMENON
Elementary migration around the Oklo nuclear reactors. Implications for high level radioactive wastes storage, 20:1774 (R;FR;In French)

OLEFINS
See ALKENES

OLIGOSACCHARIDES
Structural studies of complex carbohydrates of plant cell walls: Progress report, December 15, 1990–December 14, 1991, 20:1893 (R;US)
The structures and functions of oligosaccharins, 20:1892 (R;US)

ON-LINE COMPUTERS
See COMPUTERS

OPIX PROCESS
See RADIOACTIVE WASTE PROCESSING

OPTICAL COMPUTERS
Technologies for highly parallel optoelectronic integrated circuits, 20:2557 (R;US)

OPTICAL FIBERS
Cure monitoring with fibre optic sensors, 20:1258 (IA;AU)
Fibre optic chemical sensors, 20:1661 (IA;AU)
High frequency current sensors using the Faraday effect in optical fibers, 20:1669 (R;US)

OPTICAL RADAR
Lidar technologies for airborne and space-based applications, 20:1666 (R;US)

ORANGE EVENT
See NUCLEAR EXPLOSIONS

ORBITS
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)
Orbital magnetism in ensembles of ballistic billiards, 20:2024 (R;FR)

ORDER PARAMETERS
Analytic formulae for the Hartree-Fock order parameter at arbitrary p/q filling factors for the 2DEG in a magnetic field, 20:2362 (R;XA)

ORDNANCE
In situ analysis of soil at an open burning/open detonation disposal facility: J-Field, Aberdeen Proving Ground, Maryland, 20:1773 (R;US)
Prototype integration of the joint munitions assessment and planning model with the OSD threat methodology, 20:1678 (R;US)

ORGANIC ACIDS
Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)

ORGANIC COMPOUNDS
See also AMINES
AROMATICS
HYDROCARBONS
KETONES
NUCLEIC ACIDS
ORGANIC ACIDS
ORGANIC NITROGEN COMPOUNDS
ORGANIC PHOSPHORUS COMPOUNDS
ORGANIC POLYMERS
ORGANIC SILICON COMPOUNDS
PROTEINS
STEROIDS
A summary description of the flammable gas tank safety program, 20:411 (R;US)
Development of laser-ion beam photodissociation methods: Progress report, December 1991–November 1994, 20:1295 (R;US)
Development of novel separation techniques for biological samples in capillary electrophoresis, 20:1865 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994, 20:475 (R;US)
Photodissociation and photoionization of organosulfur radicals, 20:2294 (R;US)
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)
Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)
Volatile halogenated hydrocarbons in the marine atmosphere: Concentrations, sources and mass budgets over North Sea and Baltic Sea, 20:1741 (I;DE;In German)
Waste Tank Organic Safety Program: Analytical methods development: Progress report, FY 1994, 20:303 (R;US)

ORGANIC FLUORINE COMPOUNDS
Thermophysical properties of HFC-143a and HFC-152a: Final report, April 1, 1993–June 30, 1994, 20:1243 (R;US)

ORGANIC NITROGEN COMPOUNDS
See also AMIDES
NITRO COMPOUNDS
EPR investigations of iminoxy free radicals and paramagnetic metal-oxime systems, 20:1352 (IA;PL)
Thermal decomposition reactions of HMX and RDX and their importance in predicting cookoff hazards, 20:1689 (R;US)

ORGANIC PHOSPHORUS COMPOUNDS
Photophysical processes on triplet states and radical ions in pure and molecularly doped polymers, 20:1376 (R;US)

ORGANIC POLYMERS
See also PLASTICS
RUBBERS
BEAM applications to polymer materials, 20:1378 (IA;JP;In Japanese)

ORGANIC SILICON COMPOUNDS
See also SILANES
Investigation of thermal conductivity in polymer-ceramic HTSC composites., 20:1279 (IA;UA;In Russian)

ORIENTED NUCLEI
The study of transient NMR effects by use of statistical tensor formalism, 20:2316 (IA;AU)
Transient NMRON - recent advances, 20:2319 (IA;AU)

ORNL
Comparison of methods for developing contaminant-particle size distributions for suspended sediment, 20:227 (R;US)
Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment, 20:449 (R;US)
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)
FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results, 20:863 (R;US)
Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:462 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:464 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:461 (R;US)
Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:463 (R;US)
Health and safety work plan for sampling colloids in Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:506 (R;US)
Risk evaluation of embedded, single-walled liquid low-level waste piping at Oak Ridge National Laboratory: ESD Publication 4315, 20:246 (R;US)
Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:465 (R;US)

Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique, 20:295 (R;US)
Waste management plan for the remedial investigation of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:507 (R;US)
Waste management regulatory compliance issues related to D&D activities at Oak Ridge National Laboratory (ORNL), 20:225 (R;US)

OSCILLATIONS
See also BETATRON OSCILLATIONS
An observational study of the interaction between the synoptic-scale eddies and the intra-seasonal fluctuations in the atmosphere, 20:1711 (RA;US)
Climatic feedbacks between stationary and transient eddies, 20:1715 (RA;US)
The role of eddy transports in climate change, 20:1712 (RA;US)

OSCILLATIONS (PLASMA)
See PLASMA WAVES

OSIRIS REACTOR
Dynamic compensation of the silver self-powered neutron detector in the ramp program at Osiris reactor, 20:824 (R;FR)
OSIRIS: the first M.T.R. with a new instrumentation and control system based on digital logic of vote, 20:823 (R;FR)

OSMIUM COMPLEXES
Excited state processes in transition metal complexes. Redox splitting in soluble polymers: Progress report, July 15, 1993–July 14, 1994, 20:1374 (R;US)

OXETANE
See ETHERS

OXIDATION
See also COMBUSTION
In-situ control of solids oxidation, 20:2329 (IA;AU)

OXIRANS
See EPOXIDES

OXYGEN
Ceramic membranes for methane conversion, 20:134 (R;US)
Combustion-related studies using weakly bonded complexes: Final report, 20:1421 (R;US)
Oxygen annealing of Bi_2 Sr_2 Ca_1 Cu_2 O_{8+x} single crystals, 20:1204 (IA;AU)
Oxygen stoichiometry measurements in polycrystalline YBa_2 Cu_3 O_{7-x} by Micro-Raman spectroscopy, 20:2336 (IA;AU)
Stable isotopes of hydrogen and oxygen in surface water and ground water at selected sites on or near the Idaho National Engineering Laboratory, Idaho, 20:1783 (R;US)

OXYGEN 16 REACTIONS
Radiochemical search for neutron-rich isotopes of nielsbohrium in the $^{16}O + {}^{254}Es$ reaction, 20:2241 (R;DE)

OXYGEN EFFECT (RADIOBIOLOGY)
See OXYGEN

OXYGEN HYDRIDES
See WATER

OXYGEN IONS
Angular and charge state distributions of highly charged ions scattered during low energy surface-channeling interactions with Au(110), 20:2347 (R;US)

OZONE
A report on workshops: General circulation model study of climate- chemistry interaction, 20:1709 (R;US)
Anodic oxygen-transfer electrocatalysis at iron-doped lead dioxide electrodes, 20:1370 (R;US)
Evaluation of no-clean solder process designed to eliminate the use of ozone-depleting chemicals, 20:1763 (R;US)

P

PACIFIC NORTHWEST LABORATORIES
See BATTELLE PACIFIC NORTHWEST LABORATORIES

PACIFIC NORTHWEST REGION
See USA

PACIFIC OCEAN
Field collection of information on Pacific energy policy (outline of electric power industry in China), 20:993 (R;JP;In Japanese)
Lectures on the Pacific rim region Coal Workshop 1993, 20:93 (I;JP;In Japanese)

PACKAGING
Characterization of the back-end wastes in view of their transportation, 20:273 (IA;JP)
The acceptance, before transport, of the waste radioactive packages on the disposal facilities of ANDRA, 20:275 (IA;JP)
User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations, 20:190 (R;US)

PACKING
See STOWING

PADUCAH PLANT
Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
Streamflow, specific-conductance, and temperature data for Bayou and Little Bayou Creeks near Paducah, Kentucky, August 15 and 16, 1989, 20:454 (R;US)

PAH
See POLYCYCLIC AROMATIC HYDROCARBONS

PAIR PRODUCTION
Study of the isospin symmetry breaking in the light quark sea of the nucleon from the Drell-Yan process, 20:2385 (R;FR)

PAKISTAN
System for training and qualification of nuclear power plant personnel in Pakistan, 20:2480 (RA;XA)

PALLADIUM
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)

PALLADIUM COMPOUNDS
See also PALLADIUM HYDRIDES
Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs, 20:1507 (R;US)

PALLADIUM HYDRIDES
Determination of the deuterium order-disorder structure transition in Pd-$DO_{,65}$ at '50K', 20:1127 (IA;AU)

PALLADIUM NITRATES
See NITRATES
PALLADIUM COMPOUNDS

PANINDCO PROCESS
See COAL GASIFICATION

PAPER
1993 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site, 20:247 (R;US)

PARABOLIC DISH COLLECTORS
An overview: Component development for solar thermal systems, 20:708 (R;US)
Paraboloidal-dish solar power system: Comparative and economicaspects (SOLCOM I 1994.), 20:655 (IA;IL)
Recent reflux receiver developments under the US DOE program, 20:707 (R;US)
The U.S. Department of Energy's role in commercialization of solar thermal electric technology, 20:701 (R;US)

PARABOLIC POINT COLLECTORS
See PARABOLIC DISH COLLECTORS

PARABOLIC TROUGH COLLECTORS
Control of the collector outlet temperature at a solar collector test stand: Study, 20:705 (I;DE;In German)
Control of the collector outlet temperature at the solar test plant TESOP: Structural approximation of the point-to-point transmission function. Final report, 20:703 (I;DE;In German)

PARACHUTES
Experimental investigation of the wake behind a solid disk, 20:1680 (R;US)

PARALLEL PROCESSING
FORTRAN M: A language for modular parallel programming, 20:2530 (R;US)
HPCC technology awareness program: Improved economic competitiveness through technology awareness, transfer and application: Final report, 20:2536 (R;US)
Research in functional programming on multiprocessor architectures: Final report, 20:2535 (R;US)

The National Storage Laboratory: Overview and status, 20:2560 (R;US)

PARAMAGNETIC RESONANCE (ELECTRON)
See ELECTRON SPIN RESONANCE

PARAMAGNETIC RESONANCE (NUCLEAR)
See NUCLEAR MAGNETIC RESONANCE

PARTICLE BEAM FUSION ACCELERATOR
Induction linacs for heavy ion fusion, 20:2445 (R;US)

PARTICLE BEAMS
Crystalline beams: The horizontal zigzag: Informal report, 20:1529 (R;US)
Xwake 1.0 user's manual, 20:1535 (R;US)

PARTICLE BOOSTERS
Simulation and steering in the intertank matching section of the ground test accelerator, 20:1588 (R;US)

PARTICLE LOSSES
Implementation of Beam-Loss Monitor systems for the SSC, 20:1597 (R;US)

PARTICLE PRODUCTION
See also PAIR PRODUCTION
PHOTOPRODUCTION
Hadronization in nuclear matter, 20:2243 (R;FR)
Inclusive K_s^0 production in two photon processes, 20:2170 (RA;JP)
Inelastic leptoproduction of J/ψ, 20:2162 (R;FR)
The twist-3 single spin asymmetries of pion production, 20:2087 (R;XA)

PARTICLE-HOLE MODEL
The hole-hole superconducting pairing in the t-J model induced by long-range spin-wave exchange, 20:2366 (IA;AU)

PARTICULATES
See also TOTAL SUSPENDED PARTICULATES
A new paradigm for particle tracking velocimetry, based on graph-theory and pulsed neural network, 20:1462 (R;FR)
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994, 20:738 (R;US)
In-place testing summary (1992): Progress report, 20:286 (R;US)
Measurement of diesel exhaust particulate by using CO2 conversion.: Separating measure for volatile components and total soot by heating collection filter, 20:1071 (IA;JP;In Japanese)
Moving Bed, Granular Bed Filter Development Program: Option 1, Component Test Facility: Task 2, Identification of technical issues, 20:12 (R;US)
Results of PM_{10} and TSP monitoring at McMurdo Station, Antarctica, 20:1751 (R;US)

PASSIVE SOLAR HEATING SYSTEMS
Results from retrofitting with transparent insulation on three different residential houses in Denmark, 20:698 (RA;DK)

PATGAS PROCESS
See COAL GASIFICATION

PBFA
See PARTICLE BEAM FUSION ACCELERATOR

PBX DEVICES
The simulation of hard x-ray images obtained during lower hybrid current drive on PBX-M, 20:2421 (R;US)

PCB
See POLYCHLORINATED BIPHENYLS

PCTR REACTOR
The role of exponential and PCTR experiments at Hanford in the design of large power reactors, 20:859 (R;US)

PEBBLE BED REACTORS
Flow schemes and design features of HTGR residual heat removal systems, 20:776 (RA;XA)

PELLETRON ACCELERATORS
Exergetic analysis of refrigeration system of the Pelletron-Linac particle accelerator of the University of Sao Paulo, 20:1552 (I;BR;In Portuguese)

PELLETRONS
See PELLETRON ACCELERATORS

PELLETS (FUEL)
See FUEL PELLETS

PENETRATORS
CTH analyses of steel rod penetration into aluminum and concrete targets with comparisons to experimental data, 20:2026 (R;US)

PEOPLE
See HUMAN POPULATIONS

PEOPLES REPUBLIC OF CHINA
See CHINA

PEP STORAGE RINGS
Broad-band, multi-kilowatt, vacuum, HOM waveguide loads for the PEP-II RF cavity, 20:1613 (R;US)
High-power RF window design for the PEP-II B Factory, 20:1614 (R;US)
Operation and performance of a longitudinal damping system using parallel digital signal processing, 20:1612 (R;US)
RF Feedback Analysis for 4 cavities per klystron in PEP-II, 20:1611 (R;US)
RF feedback simulation for the PEP-II B Factory, 20:1593 (R;US)
RF system design for the PEP-II B Factory, 20:1610 (R;US)

PEPTIDES
Development of laser-ion beam photodissociation methods: Progress report, December 1991–November 1994, 20:1295 (R;US)
Solution structure analysis of the conformational changes that occur upon the binding of the protein kinase inhibitor peptide to the catalytic subunit of the cAMP dependent protein kinase, 20:1869 (R;US)

PERIOSTEUM
See BONE TISSUES

PERIPHYTON
See AUFWUCHS

PERMANENT MAGNETS
Multipole contribution from an off-axis orbit in an IR quadrupole and the consequences on the dynamic aperture, 20:1609 (R;US)

PERMITTIVITY
A practical application of the theory of hyper-complex variables: dielectric and optical response of 3-dimensional arrays of spheres of complex permittivity, 20:2320 (IA;AU)
External control of microwave properties of dielectric materials, 20:1211 (IA;AU)

PERMUTIT (INORGANIC)
See INORGANIC ION EXCHANGERS

PEROVSKITE
Cell parameters and the orthorhombic to cubic transformation in strontium substituted perovskite ($CaTiO_3$), 20:1191 (IA;AU)
Charge compensation mechanisms for aliovalent impurities in perovskite and zirconolite, 20:1213 (IA;AU)
Rotational melting in displacive quantum paraelectrics, 20:2361 (R;XA)

PERSONNEL
See also MEDICAL PERSONNEL
MILITARY PERSONNEL
MINERS
PROFESSIONAL PERSONNEL
REACTOR OPERATORS
A research study to determine the effect of Total Quality Management (TQM) on employee morale in Plant Procedures Division at EG&G, Rocky Flats, Inc., 20:911 (R;US)
Authorization and licensing of nuclear research reactor operating personnel, 20:578 (IA;EG)
Operability test report for the 300 Area Treated Effluent Disposal Facility, 20:343 (R;US)
Radiological implications of contact maintenance: Impacts on facility design, 20:415 (R;US)
WIPP facility representative program plan, 20:250 (R;US)

PERSONNEL DOSIMETRY
Development of a personal digital dosimeter, 20:1631 (I;TH;In Thai)
Time-dependent, low-dose reporting limit for dosimeters that are taken home at the end of the workday, 20:1911 (R;US)

PERSONNEL FILM DOSIMETRY
See PERSONNEL DOSIMETRY

PERSONNEL MONITORING
Personnel monitoring. 1993, 20:1945 (R;SE;In Swedish)
PESTICIDES
Solar concentration/destruction of pesticide rinsewater, 20:695 (R;US)
Trends and implications of biological analyses for agricultural operations, 20:1775 (R;US)
PETROLEUM
See also RESIDUAL PETROLEUM
Compiled Data
Petroleum supply monthly, October 1994, 20:125 (R;US)
Winter fuels report: Week ending November 11, 1994, 20:972 (R;US)
Enhanced Recovery
A model technology transfer program for independent operators: Kansas Technology Transfer Model (KTTM), 20:112 (R;US)
An evaluation of known remaining oil resources in the United States: Appendix, Project on Advanced Oil Recovery and the States, 20:106 (R;US)
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)
An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)
Assist in the recovery of bypassed oil from reservoirs in the Gulf of Mexico: Quarterly status report (final), April 1, 1994–June 31, 1994, 20:111 (R;US)
Geological and petrophysical characterization of the Ferron Sandstone for 3-D simulation of a fluvial-deltaic reservoir: Quarterly report, April 1, 1994–June 30, 1994, 20:96 (R;US)
System to inject steam and produce oil from the same wellbore through downhole valve switching: Final report, 20:119 (R;US)
Exploration
Geological and petrophysical characterization of the Ferron Sandstone for 3-D simulation of a fluvial-deltaic reservoir: Quarterly report, April 1, 1994–June 30, 1994, 20:96 (R;US)
Prices
Petroleum marketing monthly, with data for July 1994, October 1994, 20:980 (R;US)
Research Programs
Institute for Petroleum Research. Annual report 1991, 20:94 (I;DE;In German)
Institute for Petroleum Research. Annual report 1992, 20:984 (I;DE;In German)
Reserves
U.S. crude oil, natural gas, and natural gas liquids reserves - 1993 annual report, 20:101 (R;US)
Retail Prices
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
Underground Storage
Site-specific standard request for Underground Storage Tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility Buildings 9754-1 and 9720-15, 20:545 (R;US)
Wholesale Prices
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)
PETROLEUM COKE
See PETROLEUM PRODUCTS
PETROLEUM COOPERATIVES
See PETROLEUM INDUSTRY
PETROLEUM DEPOSITS
Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas, 20:120 (R;US)
Innovative techniques for the description of reservoir heterogeneity using tracers: Final report, October 1992–December 1993, 20:95 (R;US)
Revitalizing a mature oil play: Strategies for finding and producing unrecovered oil in Frio Fluvial-Deltaic reservoirs of South Texas: Technical progress report, July 1, 1994–September 30, 1994, 20:99 (R;US)
PETROLEUM INDUSTRY
Petroleum marketing monthly, with data for July 1994, October 1994, 20:980 (R;US)
PETROLEUM PRODUCTS
See also FUEL OILS
GASOLINE
Eielson Air Force Base operable unit 2 and other areas record of decision, 20:1829 (R;US)
Petroleum supply monthly, October 1994, 20:125 (R;US)
Winter fuels report, week ending October 28, 1994 (Contains glossary), 20:126 (R;US)
PHASE STABILITY
The principle of phase stability and the accelerator program at Berkeley, 1945–1954, 20:1523 (R;US)
PHASE TRANSFORMATIONS
See also EVAPORATION
Neutron diffraction measurements of time-dependent transformation of plastically deformed Mg-PSZ, 20:2333 (IA;AU)
PHONONS
Classical lattice dynamics: Foreman-Lomer theory and the Blackman sum rule, 20:2019 (IA;AU)
PHOSPHATE PROCESS
See DESULFURIZATION
PHOSPHORS
Spectroscopy and origin of radiating centers in $PbWO_4$ single crystals, 20:1282 (R;FR)
PHOSPHORUS
Recovery of phosphates from elemental phosphorus bearing wastes, 20:1036 (R;US)
PHOSPHORYLASES
See PHOSPHOTRANSFERASES
PHOSPHOTRANSFERASES
Solution structure analysis of the conformational changes that occur upon the binding of the protein kinase inhibitor peptide to the catalytic subunit of the cAMP dependent protein kinase, 20:1869 (R;US)
PHOTODETECTORS
THe proximity focused hybrid photodiode detector, 20:1647 (R;FR)
Unlimited-bandwidth distributed optical phase modulators and detectors: Design and fabrication issues, 20:1668 (R;US)
PHOTOELECTRON SPECTROSCOPY
High energy photoelectron diffraction data from GaAs surfaces, 20:2321 (IA;AU)
PHOTOEMISSION
Photoemission and ferromagnetism, 20:2310 (R;US)
Photoemission study of the Fermi surface of Cu, 20:2392 (IA;AU)
PHOTOIONIZATION
Physics of correlated studies: Final report, September 1, 1990–November 30, 1993, 20:2292 (R;US)
PHOTOLYSIS
The potential of PCB photochemistry at Moccasin Bend, 20:1777 (R;US)
PHOTOMAGNETOELECTRIC EFFECT
See MAGNETIC FIELDS
PHOTON-ELECTRON INTERACTIONS
Deep inelastic $e\gamma$scattering, with beamsstrahlung, 20:1619 (RA;DE)
Discovering supersymmetry with electron and photon beams, 20:2138 (RA;DE)
Gauge-boson production in electron-photon collisions, 20:2114 (RA;DE)
Testing the anomalous ZZ$\gamma$and Z$\gamma\gamma$vertices in $e\gamma \rightarrow eZ$, 20:2119 (RA;DE)
W, Z and H bosons in the three particle final states production at TeV energy γe and $\gamma\gamma$colliders, 20:2142 (RA;DE)

PHOTON-PHOTON INTERACTIONS
Discovering supersymmetry with electron and photon beams, 20:2138 (RA;DE)
Gauge invariance in off-shell W pair production, 20:2110 (RA;DE)
Pair neutral gauge boson production and Higgs signal in γ-γcollisions: $\gamma\gamma\rightarrow\gamma\gamma$, $\gamma\gamma\rightarrow$ ZZ, $\gamma\gamma\rightarrow$ HH, 20:2141 (RA;DE)
Radiative corrections to leptoquark pair production in e^+e^- annihilation, 20:2135 (RA;DE)
The reaction $\gamma\gamma \rightarrow \pi^0\pi^0$ in generalized chiral perturbation theory, 20:2166 (R;FR)
Two-photon physics: Physics Publication No. 83-175, 20:2148 (R;US)
Uncertainties in in calculations of the $\gamma\gamma$minijet cross section, 20:2140 (RA;DE)
W, Z and H bosons in the three particle final states production at TeV energy γe and $\gamma\gamma$colliders, 20:2142 (RA;DE)

PHOTONS
A study of single photon production with the TOPAZ detector, 20:2175 (RA;JP)

PHOTOPRODUCTION
Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha^2_s)$, 20:2143 (R;DE;In German)
Studies of prompt photon production and multijet production at the Tevatron Collider, 20:2153 (R;US)
Unbinned maximum likelihood fit for the CP conserving couplings for W + photon production at CDF, 20:2030 (R;US)

PHOTOVOLTAIC CELLS
See also SOLAR CELLS
Large-area triple-junction a-Si alloy production scaleup: Annual subcontract report, 17 March 1993–18 March 1994, 20:686 (R;US)
Outdoor I-V curves versus simulator measurements for characterizing photovoltaic modules (SOLCOM I 1994.), 20:647 (IA;IL)
The relative degradation of various kinds of photovoltaic module after 6-7 years exposure to desert conditions (SOLCOM I 1994.), 20:646 (IA;IL)

PHOTOVOLTAIC CONVERSION
Highlights of recent balance of system research and evaluation, 20:694 (R;US)

PHOTOVOLTAIC POWER PLANTS
Evaluation of the total cost of different photovoltaic cells and combined photovoltaic-thermal solar designs for the first Russian photovoltaic 1 MW power plant (SOLCOM I 1994.), 20:663 (IA;IL)
Life cycle analysis of photovoltaic-supplied solar filling stations for electric passenger vehicles (SOLCOM I 1994.), 20:654 (IA;IL)
Photovoltaic power plant for the partial supply of the new training center of the Hamburgische Electricitaets-Werke AG: Final report, 20:693 (I;DE;In German)
Photovoltaics: Present status and comparative analyses (SOLCOM I 1994.), 20:673 (IA;IL)

PHOTOVOLTAIC POWER SUPPLIES
Grid-connected solar power generation a utility's view (SOLCOM I 1994.), 20:680 (IA;IL)
Photovoltaic solar filling station Hannover Fair 1988: Final report, 20:1079 (R;DE;In German)
Residential photovoltaic hybrid power system (SOLCOM I 1994.), 20:657 (IA;IL)

PHYSICAL CONSTANTS TEST REACTOR
See PCTR REACTOR

PICEANCE CREEK BASIN
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, January 1, 1994–March 31, 1994, 20:133 (R;US)
Naturally fractured tight gas reservoir detection optimization: Quarterly status report, October 1, 1993–January 30, 1994, 20:132 (R;US)

PIGE ANALYSIS
See NUCLEAR REACTION ANALYSIS
PROMPT GAMMA RADIATION
PROTON REACTIONS

PILOT PLANTS
See also WIPP
200 Area weekly report, 20:167 (R;US)
Systemic representation of a production system: the Sagace method, 20:222 (R;FR;In French)

PIN STRIPE EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

PINES
Exclusion experiment for gaseous pollutants in spruces at Edelmannshof: concept and first element-budget data, 20:1810 (IA;DE;In German)
The effects of acid irrigation and compensation liming on soil and trees in a mature Norway spruce stand (Hoeglwald project), 20:1811 (IA;DE)

PINNING FORCE
See MAGNETIC FLUX

PINS (FUEL)
See FUEL PINS

PION-KAON INTERACTIONS
A possible experimental determination of m_e/m-circumflex from $K_{\mu 4}$ decays, 20:2194 (R;FR)

PION-NUCLEON INTERACTIONS
Radiative corrections for pion polarizability experiments, 20:2160 (R;XA)

PION-PION INTERACTIONS
Relativistic effects in the scalar meson dynamics, 20:2163 (R;FR)

PIONS
π-η mixing from QCD sum rules, 20:2081 (R;US)
Single spin asymmetry in inclusive pion production, Collins effect and the string model, 20:2198 (R;FR)
The twist-3 single spin asymmetries of pion production, 20:2087 (R;XA)
Zero sound velocity in π, ρ mesons at different temperatures, 20:2088 (R;XA)

PIPES
241-SY-101 air lance removal lessons learned, 20:531 (R;US)
A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)
Final report on evaluation of cyclocraft support of oil and gas operations in wetland areas, 20:120 (R;US)
Risk evaluation of embedded, single-walled liquid low-level waste piping at Oak Ridge National Laboratory: ESD Publication 4315, 20:246 (R;US)
Unknown plant de-construction hazard – Toxic COS and CS_2 gas from torch cutting of pipe, 20:613 (R;US)

PIRCON-PECK PROCESS
See DESULFURIZATION

PITCHES
Upgrading mild gasification liquids to produce electrode binder pitch: [Quarterly] technical report, December 1, 1993–February 28, 1994, 20:38 (R;US)

PITTSBURGH OXYDESULFURIZATION PROCESS
See DESULFURIZATION

PIXE ANALYSIS
Enhancements in the Livermore spectrum analysis package PIXEF, 20:2341 (R;US)

PLANNED COMMUNITIES
Promoted structuring of model to introduce petroleum substitution energy in Hokkaido's New City Base for Regional Administration of Industry and Culture, 20:1060 (I;JP;In Japanese)

PLANT BREEDING
Method for the transfer of genes in winter rape to plant breeders praxis: Final report, 20:617 (I;DE;In German)
Plant breeding and genetic engineering, 20:1895 (I;DE;In German)

PLANT CELLS
Structural studies of complex carbohydrates of plant cell walls: Progress report, December 15, 1990–December 14, 1991, 20:1893 (R;US)

PLANT GROWTH REGULATORS
Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)

PLANTS
Direct effects of atmospheric CO_2 enrichment on plants and ecosystems: An updated bibliographic data base, 20:1968 (R;US)

Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site, 20:469 (R;US)
State of the discussion on standard values for atmospheric pollutant concentrations, 20:1819 (IA;DE;In German)
Status of the flora and fauna on the Nevada Test Site, 1993: Results of continuing basic environmental monitoring, January through December 1993, 20:1789 (R;US)

PLANTS (INDUSTRIAL)
See INDUSTRIAL PLANTS

PLANTS (PILOT)
See PILOT PLANTS

PLANTS (POWER)
See POWER PLANTS

PLASMA
See also HOT PLASMA
LASER-PRODUCED PLASMA
NON-EQUILIBRIUM PLASMA
Generalized relaxation theory and vortices in plasmas, 20:2009 (R;US)
Plasma characteristics determined by the Freja electric field instrument, 20:2426 (R;SE)
Self-focusing of electromagnetic radiation in electron-positron ion plasma, 20:2409 (R;XA)
Solitons in electron-positron plasma, 20:2411 (R;XA)
Visible photoluminescence from hydrogenated silicon particles suspended in a silane plasma, 20:2418 (R;CH)

PLASMA (BLOOD)
See BLOOD PLASMA

PLASMA (QUARK)
See QUARK MATTER

PLASMA ACCELERATORS
See PLASMA GUNS

PLASMA CONFINEMENT
See also INERTIAL CONFINEMENT
MAGNETIC CONFINEMENT
Theory of the L-H transition, 20:2408 (R;US)

PLASMA DIAGNOSTICS
Construction of a nitrogen laser for plasma diagnostics, 20:2412 (R;XA)
D-T radiation effects on TFTR diagnostics, 20:2420 (R;US)
Evolution of Spark plasma using nitrogen laser shadowgraphy system, 20:2410 (R;XA)
The simulation of hard x-ray images obtained during lower hybrid current drive on PBX-M, 20:2421 (R;US)

PLASMA FOCUS
Plasma focus matching conditions, 20:2401 (R;EG)

PLASMA GUNS
Plasma processing for integrated circuits, 20:1498 (R;US)
Plasma rotation in coaxial discharges, 20:2399 (R;EG)

PLASMA OSCILLATIONS
See PLASMA WAVES

PLASMA PRODUCTION
Studies on the transport and on the focusing of intense, high-energetic heavy ion beams for the production of high energy density in matter, 20:1551 (R;DE)

PLASMA SHEATH
Viscosity effect on plasma sheath dynamic in plasma focus, 20:2400 (R;EG)

PLASMA WAVES
Fluctuations and electromagnetic wave scattering in macroscopically agitated plasma: effects of turbulent diffusion, 20:2415 (R;UA)
Fluctuations in macroscopically agitated plasma:quasiparticles and effective temperature, 20:2414 (R;UA)

PLASMONS
Surface plasmon observed for carbon nanotubes, 20:2345 (R;AU)

PLASTIC PROPERTIES
See PLASTICITY

PLASTIC SCINTILLATION COUNTERS
See PLASTIC SCINTILLATION DETECTORS

PLASTIC SCINTILLATION DETECTORS
A large-area scintillation detector with matrix readout for experiments at COSY, 20:1643 (R;DE;In German)

PLASTICITY
On the Taylor test, Part 3: A continuum mechanics code analysis of steady plastic wave propagation, 20:1154 (R;US)

PLASTICS
See also POLYSTYRENE
POLYURETHANES
Plastic encapsulated parts, 20:1501 (R;US)

PLATES
Computational design of hypervelocity launchers, 20:1444 (R;US)

PLATES (FUEL)
See FUEL PLATES

PLATINUM
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)

PLESIOTHERAPY
See RADIOTHERAPY

PLOWS (COAL)
See COAL PLOWS

PLUTONIUM
Advanced pyrochemical technologies for minimizing nuclear waste, 20:321 (R;US)
Atomic energy policy of Japan, especially plutonium utilization policy, 20:953 (I;XA)
High-level assessment of LANL ABC Design, 20:788 (R;US)
Performance report for a small package counter that uses active neutron interrogation, 20:559 (R;US)
Plutonium and tritium produced in the Hanford Site production reactors, 20:563 (R;US)
Sludge Stabilization Campaign blend plan, 20:338 (R;US)
The FRAM code: Description and some comparisons with MGA, 20:1331 (R;US)
User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations, 20:190 (R;US)

PLUTONIUM 239 TARGET
Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994, 20:2276 (R;US)

PLUTONIUM IONS
Electronic spectra of plutonium ions in nitric acid and in lithium nitrate solutions, 20:1409 (R;EG)

PLUTONIUM ISOTOPES
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

PLUTONIUM OXIDES
A safeguards approach applicable to A plutonium mixed oxide powder plant, 20:162 (R;EG)
Clad vent set cup open end (closure weld zone) wall-thickness study, 20:819 (R;US)

PLUTONIUM RECYCLE TEST REACTOR
See PRTR REACTOR

PMMA
Topography of neutron scattering from diblock copolymer film, 20:1239 (R;US)

PNA
See POLYCYCLIC AROMATIC HYDROCARBONS

PNL
See BATTELLE PACIFIC NORTHWEST LABORATORIES

POINCARE GROUPS
Exact solution of 2 D Poincare gravity coupled with fermion matter, 20:2097 (R;XJ)

POINT CONTACTS
See ELECTRIC CONTACTS

POISONS (CHEMICAL)
See HAZARDOUS MATERIALS

POKHRAN EVENT
See NUCLEAR EXPLOSIONS

POLARIZABILITY
The reaction $\gamma\gamma \rightarrow \pi^0\pi^0$ in generalized chiral perturbation theory, 20:2166 (R;FR)

POLARIZATION
Orientation and polarization effects in the Raman spectroscopy of (110) diamond faces in CVD deposited diamond films, 20:1257 (IA;AU)

POLARIZED BEAMS
Few body physics with polarized photons, 20:2234 (R;US)

POLARIZED NUCLEI
See ORIENTED NUCLEI

POLLUTANTS
CERCLA site assessment workbook, 20:914 (R;US)
Concentration, trend and distribution of reactive trace gases in rural Germany in the context of forest damage, 20:1756 (IA;DE)
Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91, 20:451 (R;US)
Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness, 20:912 (RA;US)
H-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:441 (R;US)
Investigation of sorption and desorption of heavy metals at sediments from the 'Lahn' and assessment of its exposure to danger caused by heavy metals, 20:1853 (I;DE;In German)
Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico, 20:459 (R;US)
Quarterly report of RCRA groundwater monitoring data for period April 1 through June 30, 1994, 20:455 (R;US)
Summary and evaluation of hydraulic property data available for the Hanford Site upper basalt confined aquifer system, 20:307 (R;US)
Support of the EMEP-project: European wide depositions of sulphur and nitrogen compounds as a consequence of sulphur, nitrogen oxides and ammonia emissions, 20:1745 (R;DE;In German)
Temporal development of the pollution load of reactive trace gases in forested areas in the United States, 20:1757 (IA;DE)
The Savannah River Site's groundwater monitoring program: First quarter 1994, 20:458 (R;US)
Toxicological benchmarks for wildlife: 1994 Revision, 20:457 (R;US)
U.S. Fish and Wildlife Service lands biomonitoring operations manual, 20:1793 (R;US)

POLLUTION ABATEMENT
See also AIR POLLUTION ABATEMENT
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
Pollution prevention: Avoiding the need to manage wastes, 20:1053 (R;US)
Special issue review of pollution prevention management within the Department of Energy, final report, 20:915 (R;US)
Survey of 1993 coal production/utilization technology promotion subsidy area models.: Area model survey as measures for environmental load reduction (interim report), 20:1047 (R;JP;In Japanese)

POLLUTION CONTROL
See also WATER POLLUTION CONTROL
Economics, funding and the influence of politics on the UMTRA Project, 20:908 (RA;US)
Economics, funding and the influence of politics on the Wismut Program, 20:907 (RA;US)
Quality assurance, documentation, and long-term monitoring, 20:484 (RA;US)
Special issue review of pollution prevention management within the Department of Energy, final report, 20:915 (R;US)
Tailings remediation at UMTRA Project Sites: Engineering practices, 20:482 (RA;US)
The US DOE Environmental Restoration Program – a Washington perspective, 20:976 (RA;US)
The Uranium Mill Tailings Radiation Control Act and its implementation from a regulatory perspective, 20:483 (RA;US)

POLLUTION CONTROL EQUIPMENT
See also AIR FILTERS
ELECTROSTATIC PRECIPITATORS
INERTIAL SEPARATORS
In-place testing summary (1992): Progress report, 20:286 (R;US)
LIFAC Sorbent Injection Desulfurization Demonstration Project: Quarterly report number 14, January–March, 1994, 20:67 (R;US)

POLLUTION REGULATIONS
See also CONTAMINATION REGULATIONS
1993 environmental monitoring report for the naval reactors facility, 20:460 (R;US)
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
Environmental Protection implementation plan for the Waste Isolation Pilot Plant, November 9, 1994, to November 9, 1995, 20:251 (R;US)
Facility effluent monitoring plan for the B plant, 20:324 (R;US)
Federal and state regulatory requirements for decontamination and decommissioning at US Department of Energy Oak Ridge Operations Facilities, 20:500 (R;US)
LLNL NESHAPs, 1993 annual report, 20:515 (R;US)
Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993, 20:298 (R;US)

POLY(ISOBUTYLENE OXIDE)
See EPOXIDES
ORGANIC POLYMERS

POLYACRYLONITRILE
See ORGANIC POLYMERS

POLYATOMIC MOLECULES
See MOLECULES

POLYCHLORINATED BIPHENYLS
The potential of PCB photochemistry at Moccasin Bend, 20:1777 (R;US)
Work plan for the treatability study for PCB dehalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:1790 (R;US)

POLYCYCLIC AROMATIC HYDROCARBONS
Nitration of polynuclear aromatic hydrocarbons in coal combustors and exhaust streams: Quarterly report, April 1, 1994–June 30, 1994, 20:55 (R;US)

POLYCYCLIC SULFUR HETEROCYCLES
Selenophene transition metal complexes, 20:1364 (R;US)

POLYMERIZATION
Property improvement by gamma polymerization of methyl methacrylate impregnated local Thai wood Yang (Dipterocarpus Sp.), 20:1251 (IA;TH;In Thai)

POLYMERS
See also ETHYLENE PROPYLENE DIENE POLYMERS
ORGANIC POLYMERS
SILICONES
Preparation and characterisation of certain conducting polymer thin film devices, 20:1254 (IA;AU)

POLYMETHYLMETHACRYLATES
See PMMA

POLYNUCLEAR AROMATIC HYDROCARBONS
See POLYCYCLIC AROMATIC HYDROCARBONS

POLYSTYRENE
Topography of neutron scattering from diblock copolymer film, 20:1239 (R;US)

POLYTETRAOXANE
See ORGANIC POLYMERS

POLYTHIONATES
See SULFUR COMPOUNDS

POLYTHIONIC ACIDS
See INORGANIC ACIDS
SULFUR COMPOUNDS

POLYURETHANES
Impact-limiting materials characterization, 20:1119 (IA;JP)

POOL BOILING
One component, volume heated, boiling pool thermohydraulics, 20:790 (R;FR)

POPULATION DENSITY
Conservation and reconstruction of forests in the medium-range mountains of the German Democratic Republic under the impact of nuisances, 20:1815 (IA;DE;In German)

POPULATION DYNAMICS
Development of paradigms for the dynamics of structured populations, 20:1862 (R;US)

POROUS MATERIALS
Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material, 20:1425 (R;US)
Modification of chemical and physical factors in steamflood to increase heavy oil recovery: Annual report, October 1, 1992–September 30, 1993, 20:115 (R;US)
Porous silicon studies by soft X-ray emission spectroscopy, 20:2323 (IA;AU)

PORTSMOUTH GASEOUS DIFFUSION PLANT
Analysis of criticality alarm system response to an accidental criticality outside the cascade process buildings at the Portsmouth Gaseous Diffusion Plant, 20:151 (R;US)

POSITION SENSITIVE DETECTORS
A large-area scintillation detector with matrix readout for experiments at COSY, 20:1643 (R;DE;In German)

POSITRON-ELECTRON-PROTON STORAGE RING
See PEP STORAGE RINGS

POST-IRRADIATION EXAMINATION
Modular bench for non destructive controls, 20:1481 (R;FR;In French)

POTABLE WATER
See DRINKING WATER

POTASSIUM PHOSPHATES
An investigation of the chemical and physical properties of pristine, electrochromically damaged, and photochromically damaged $KTiOPO_4$ (KTP) using surface analytical and optical spectroscopic techniques, 20:1503 (R;US)

POTENTIAL FLOW
Solution of potential flow problems on a network of workstations, 20:2533 (R;US)

POTT-BROCHE PROCESS
See COAL LIQUEFACTION

POWDERS
Size and surface AREA analysis of some metallic and intermetallic powders, 20:1292 (R;EG)

POWER
See also ELECTRIC POWER
NUCLEAR POWER
Impact of increasing MHTGR power on passive heat removal, 20:778 (RA;XA)

POWER DEMAND
Residential appliance data, assumptions and methodology for end-use forecasting with EPRI-REEPS 2.1, 20:990 (R;US)
Technology data characterizing lighting in commercial buildings: Application to end-use forecasting with commend 4.0, 20:991 (R;US)
Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0, 20:1020 (R;US)

POWER GENERATION
See also COGENERATION
Advanced gas turbine systems research: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:727 (R;US)
Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly status report, April 1993–June 1993, 20:1010 (R;US)
There's no way without cooling: All energy conversion processes produce waste heat, 20:732 (I;DE;In German)

POWER PLANTS
See also FUEL CELL POWER PLANTS
GAS TURBINE POWER PLANTS
HYDROELECTRIC POWER PLANTS
SOLAR POWER PLANTS
WIND POWER PLANTS
Lidar technologies for airborne and space-based applications, 20:1666 (R;US)

POWER POOLS
See INTERCONNECTED POWER SYSTEMS

POWER SYSTEMS
See also INTERCONNECTED POWER SYSTEMS
A survey of artificial neural network applications in flow analysis of energy networks, 20:2546 (R;US)
Electrical simulation and analysis of large complex electrical systems, 20:884 (R;US)
Utilizing artificial neural networks in netwsork flow analysis: An annotated bibliography, 20:2547 (R;US)
Village power hybrid systems development in the United States, 20:1001 (R;US)

PRASEODYMIUM ALLOYS
Magnetic properties of a novel Pr-Fe-Ti phase, 20:1133 (IA;AU)

PRASEODYMIUM OXIDES
Electronic structural changes in Y_{1-x} Pr_x Ba_2 Cu_3 $O_{7-\delta}$ single crystals due to Pr4f states, 20:2395 (IA;AU)

PRECIPITATIONS (ATMOSPHERIC)
See ATMOSPHERIC PRECIPITATIONS

PREDATOR-PREY INTERACTIONS
Development of paradigms for the dynamics of structured populations, 20:1862 (R;US)

PRESSURE DROP
Improvement of pressure drop calculation model in TRAC-PF1 code, 20:765 (R;JP;In Japanese)

PRESSURE VESSELS
Discussion of plastic instabilities of a pressure vessel by means of the finite element method, 20:809 (R;DE;In German)
Dual shell pressure balanced reactor vessel: Final project report, 20:304 (R;US)
Effect of neutron irradiation on the impact properties of A533B steel, 20:1162 (R;US)
Heat transfer in the upper part of the HTTR pressure vessel during loss of forced cooling, 20:783 (RA;XA)
Neutron spectrum effect on PV-steels embrittlement: dosimetry and qualification of irradiation locations in Osiris and Siloe reactors, 20:756 (R;FR)
Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)
Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants, 20:755 (R;FR;In French)

PRESSURIZED WATER COOLED MODERATED REACTOR
See PWR TYPE REACTORS

PRESSURIZED WATER REACTORS
See PWR TYPE REACTORS

PRIMARY COOLANT CIRCUITS
Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)

PRINTED CIRCUITS
Evaluation of no-clean solder process designed to eliminate the use of ozone-depleting chemicals, 20:1763 (R;US)

PROCESS HEAT
Generalized assessment of heat-storage accumulators based on energy profiles, 20:1037 (R;US)

PROCESSING (DATA)
See DATA PROCESSING

PRODUCTION (ISOTOPE)
See ISOTOPE PRODUCTION

PRODUCTION (PAIR)
See PAIR PRODUCTION

PRODUCTION (PARTICLE)
See PARTICLE PRODUCTION

PRODUCTION (PLASMA)
See PLASMA PRODUCTION

PRODUCTION REACTORS
See also SPECIAL PRODUCTION REACTORS
Mid-year financial plan, fiscal year 1954 process development, 20:842 (R;US)
Minutes of Technical Division Steering Committee Meeting, May 10, 1955, Savannah River Laboratory, 20:844 (R;US)
Report of material and equipment section's activities at New York Shipbuilding Corp. during fabrication of AXC 167 1/2 starting May 18, 1951: Part 9, Section 1 and 2, 20:868 (R;US)

Weekly report November 18 to December 1, 1955: 300-M Area, Savannah River Plant, 20:845 (R;US)
Weekly report, 100 Areas, June 2, 1955, 20:855 (R;US)
Weekly report, 100 Areas, May 26, 1955, 20:854 (R;US)

PROFESSIONAL PERSONNEL
See also ENGINEERS
SCIENTIFIC PERSONNEL
Engineering faculty forum: Final report, June 1, 1993–May 31, 1994, 20:926 (R;US)

PROGRAM MANAGEMENT
Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 1, Introduction, 20:1795 (R;US)
Information Management Architecture for an Integrated Computing Environment for the Environmental Restoration Program: Volume 2, Interim business systems guidance, 20:1796 (R;US)
Performance measurement process, guidance document, 20:928 (R;US)

PROGRAMMING
See also PARALLEL PROCESSING
Adventures in supercomputing, a K-12 program in computational science: An assessment, 20:1427 (R;US)

PROJECT MANAGEMENT
See PROGRAM MANAGEMENT

PROJECTILES
A Hypervelocity Experimental Research Database (HERD): Support for the Wright Laboratory Armament Directorate Code Validation Program (COVAL), 20:1698 (R;US)
A comparison of phase change phenomena in CTH with experimental data, 20:1682 (R;US)

PROMPT GAMMA RADIATION
Application of prompt gamma ray neutron activation analysis, 20:611 (IA;TH;In Thai)
Thermal neutron capture gamma ray analysis with NaI(Tl) detector, 20:610 (IA;TH;In Thai)

PROPAGATION (WAVE)
See WAVE PROPAGATION

PROPANE
Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)
Volatiles combustion in fluidized beds: Technical progress report, 4 June 1994–3 September 1994, 20:1423 (R;US)
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report, 20:127 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending November 11, 1994, 20:972 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)

PROPELLANTS
Influence of porosity and two-phase flow on diffusional/thermal instability of a deflagrating energetic material, 20:1425 (R;US)

PROPENE
See PROPYLENE

PROPERTIES (MECHANICAL)
See MECHANICAL PROPERTIES

PROPULSION SYSTEMS
Integrated null-flux suspension and multiphase propulsion system for magnetically-levitated vehicles, 20:1080 (PA;US)

PROPYLENE
Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992), 20:28 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993), 20:31 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992), 20:26 (R;US)

PROTACTINIUM ISOTOPES
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

PROTECTION (RADIATION)
See RADIATION PROTECTION

PROTECTIVE COATINGS
An evaluation of the fire barrier system thermo-lag 330-1, 20:812 (R;US)

PROTEINS
See also PEPTIDES
Chemical interactions between protein molecules and polymer membrane materials: Annual progress report, February 1, 1994–October 31, 1994, 20:1343 (R;US)
Development of novel separation techniques for biological samples in capillary electrophoresis, 20:1865 (R;US)
Multi-basin dynamics of a protein in aqueous solution, 20:1867 (R;US)
Novel absorption detection techniques for capillary electrophoresis, 20:1327 (R;US)

PROTON REACTIONS
Coherent and incoherent elastic proton scattering by ^{6} Li nucleus at intermediate energies., 20:2230 (R;UA)

PROTON-ANTIPROTON INTERACTIONS
Measurement of the reaction anti pp→ΦΦ at the experiment JETSET, 20:2168 (R;DE;In German)
Studies of prompt photon production and multijet production at the Tevatron Collider, 20:2153 (R;US)
Unbinned maximum likelihood fit for the CP conserving couplings for W + photon production at CDF, 20:2030 (R;US)

PROTON-INDUCED X-RAY EMISSION ANALYSIS
See PIXE ANALYSIS

PROTON-PROTON INTERACTIONS
On the coherence between high-energy total cross-section data when compared with general principles, 20:2165 (R;FR)
Strangeness production in the pp and pp scattering, 20:1646 (R;DE;In German)

PROTONS
Calculations of neutron and proton radii of cesium isotopes: Final report, April 23–September 30, 1993, 20:2221 (R;US)
Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)

PROTOPLASTS
See PLANT CELLS

PRTR REACTOR
Planned mode of operation – PRTR chemical shim, 20:822 (R;US)
Technical design criteria – PRTR high power density core, 20:858 (R;US)

PSI-3105 RESONANCES
See J PSI-3097 MESONS

PUBLIC HEALTH
CERCLA site assessment workbook, Volume 1, 20:233 (R;US)
Environmental and health effects of various energy systems, 20:943 (I;XA)
Environmental and health effects of various energy systems, 20:958 (I;XA)
Medical University of South Carolina Environmental Hazards Assessment Program: Deliverables: Volume 3, Annual report, July 1, 1993–June 30, 1994, 20:2450 (R;US)
Medical University of South Carolina Environmental Hazards Assessment Program: Deliverables: Volume 2, Annual report, July 1, 1993–June 30, 1994, 20:2449 (R;US)

PUBLIC INFORMATION
Mass media and nuclear energy - IAEA's role, 20:959 (I;XA)

PUBLIC TRANSPORTATION SYSTEMS
See TRANSPORTATION SYSTEMS

PULPS
See SLURRIES

PULSARS
Properties of strange-matter stars, 20:2025 (R;US)

PULVERIZED FUEL ASH
See FLY ASH
PULVERIZED FUELS
Particulate behavior in a controlled-profile pulverized coal-fired reactor: A study of coupled turbulent particle dispersion and thermal radiation transport: Quarterly technical progress report, December 15, 1993–March 14, 1994, 20:89 (R;US)
PULVERIZERS
Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)
PUMPS
200 Area weekly report, 20:178 (R;US)
200 Area weekly report, 20:179 (R;US)
200 Area weekly report, 20:169 (R;US)
200 Area weekly report, 20:174 (R;US)
200 Area weekly report, 20:179 (R;US)
200 Area weekly report, 20:178 (R;US)
Acceptance test procedure, 241-SY-101/241-C-106 shot loading system, 20:374 (R;US)
Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)
System design description for mini-dacs data acquisition and control system, 20:1460 (R;US)
Tritium pumps which once contained mercury meet the RCRA definition of "empty container", 20:430 (R;US)
Weekly report - 100 Areas, 20:853 (R;US)
Weekly report - 100 Areas - March 17, 1955, 20:849 (R;US)
PUNCHED CARDS
See MEMORY DEVICES
PURASIV S PROCESS
See DESULFURIZATION
PUREX PROCESS
Transition projects FY 1995 multi-year program plan/fiscal year work plan WBS 1.3.1. and 7.1, 20:539 (R;US)
PWR TYPE REACTORS
See also KOZLODUY-1 REACTOR
MIDLAND-1 REACTOR
WWER TYPE REACTORS
Air-water simulation of phenomena of corium dispersion in direct containment heating, 20:881 (R;US)
Improvement of pressure drop calculation model in TRAC-PF1 code, 20:765 (R;JP;In Japanese)
Loss of residual heat removal during mid-loop operation: Bethsy experiments, 20:758 (R;FR)
Modular bench for non destructive controls, 20:1481 (R;FR;In French)
Neutron spectrum effect on PV-steels embrittlement: dosimetry and qualification of irradiation locations in Osiris and Siloe reactors, 20:756 (R;FR)
On the prediction of flooding phenomenon with the Cathare code, 20:748 (R;FR)
PWR accident management realated tests: some Bethsy results, 20:757 (R;FR)
Reflux condenser mode with non-condensible gas: assessment of Cathare against Bethsy test 7.2C, 20:759 (R;FR)
Retrospective dosimetry (or self dosimetry): Application to French Nuclear Power Plants, 20:755 (R;FR;In French)
The effect of grid assembly mixing vanes on critical heat flux values and azimuthal location in fuel assemblies, 20:760 (R;FR)
The evaluation and demonstration of methods for improved nuclear fuel utilization: Final report, 20:762 (R;US)
The top-down reflooding model in the Cathare code, 20:761 (R;FR)
PYRITE
Development of enhanced sulfur rejection processes: Final technical progress report: Seventh quarter, April 1, 1994–June 30, 1994, 20:5 (R;US)
PYRITES
See PYRITE
PYROCHEMICAL REPROCESSING
Advanced pyrochemical technologies for minimizing nuclear waste, 20:321 (R;US)
PYROLYTIC OILS
Program and abstracts, 20:629 (R;US)
PYRROLES
Stability of polypyrrole tapes at high current densities, 20:1267 (IA;AU)
Thermal characteristics of electric cables with polypyrrole coated conductors, 20:1274 (IA;AU)
PZT
Character of electromechanical coupling in ceramic materials near F-AF phase boundary, 20:1181 (IA;AU)

Q

Q CODES
QMRPACK user's guide, 20:2553 (R;US)
QUADRUPOLE LINACS
Behavior of off-centered beams in an RFQ due to image charge force, 20:1536 (RA;JP)
Design and construction of the TIT RFQ, 20:1559 (RA;JP;In Japanese)
Low power RF field tuning of a four-vane type RFQ for the JHP, 20:1558 (RA;JP;In Japanese)
Particle optics in the TIT-RFQ calculated using a 3D particle-in-cell code, 20:1537 (RA;JP;In Japanese)
Tunable frequency 4-rod RFQ, 20:1557 (RA;JP;In Japanese)
QUANTUM CHROMODYNAMICS
Effective field theories from QCD, 20:2083 (R;DE)
Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha^2_s)$, 20:2143 (R;DE;In German)
Strong interactions studies with medium energy probes: Progress report, 1993–1994, 20:2079 (R;US)
Studies of QCD in e^+e^- collisions at 500 GeV, 20:2129 (RA;DE)
Uncertainties in in calculations of the $\gamma\gamma$minijet cross section, 20:2140 (RA;DE)
QUANTUM ELECTRODYNAMICS
See also SCHWINGER-TOMONAGA FORMALISM
Approximation for on-shell W-pair production at high and intermediate energies, 20:2111 (RA;DE)
Dynamical chiral symmetry breaking in scale invariant quantum electrodynamics in sixth dimensions, 20:2094 (R;UA;In Russian)
Initial stet radiation corrections to off-shell W-pair production in e^+e^--annihilation, 20:2112 (RA;DE)
Massless particles, electromagnetism, and Rieffel induction, 20:2077 (R;DE)
Matrix element and complex l-plane evaluation of two-loop vacuum amplitudes in QED on S4, 20:2071 (R;AU)
Photoproduction of jets at HERA with resolved photons up to the order $O(\alpha\alpha^2_s)$, 20:2143 (R;DE;In German)
WOPPER - a Monte Carlo event generator for W off-shell pair production including higher order electromagnetic radiative corrections, 20:2113 (RA;DE)
QUANTUM FIELD THEORY
See also LAGRANGIAN FIELD THEORY
LATTICE FIELD THEORY
QUANTUM CHROMODYNAMICS
QUANTUM ELECTRODYNAMICS
QUANTUM FLAVORDYNAMICS
QUANTUM GRAVITY
A covariant canonical description of Liouville field theory, 20:2067 (R;AU)
Equivariant Kaehler geometry and localization in the G/G model, 20:2036 (R;XA)
Matrix element and complex l-plane evaluation of two-loop vacuum amplitudes in QED on S4, 20:2071 (R;AU)
On D=2 (1/3, 1/3) supersymmetric theories 1, 20:2038 (R;XA)
On D=2 (1/3,1/3) supersymmetric theories 2, 20:2039 (R;XA)
QUANTUM FLAVORDYNAMICS
Anomalous selfinteractions of gauge bosons in WWZ and ZZZ production at NLC, 20:2118 (RA;DE)
Model independent constraints on extra Z bosons at a 500 GeV e^+e^- collider, 20:2130 (RA;DE)
Parameterizations of the W anomalous self-couplings, 20:2075 (RA;DE)
Single W production at NLC, 20:2116 (RA;DE)

Strong resonances effects at future e^+e^- colliders, 20:2133 (RA;DE)
Testing the anomalous ZZ$\gamma$and Z$\gamma\gamma$vertices in $e\gamma \rightarrow eZ$, 20:2119 (RA;DE)
Tests of trilinear couplings of the vector bosons at future e^+e^--collider, 20:2115 (RA;DE)
Trilinear and quadrilinear W couplings in triple vector production, 20:2117 (RA;DE)
Z - Z' and exotic lepton mixing in $e^+e^- \rightarrow W^+W^-$ at high energy with polarized beams, 20:2131 (RA;DE)

QUANTUM FLUIDS
Correlated density matrix theory of spatially inhomogeneous Bose fluids, 20:2388 (R;XA)
Correlated wavefunction Monte Carlo studies of excitations in the quantum Hall liquids, 20:2397 (R;US)

QUANTUM GRAVITY
A string derivation of the $ matrix, 20:2062 (R;FR)
Canonical formulation of gravitation- and supergravitation theories, 20:2008 (R;DE;In German)
Geometric gauge fields in semiclassical gravity, 20:2042 (R;XA)
On black holes, space-time foam and the nature of time in string theory, 20:2061 (R;FR)

QUANTUM MECHANICS
"Charge-Dyon" system as the reduced oscillator, 20:1979 (R;XA)
Can we test the many-Hilbert-space approach to quantum mechanics?, 20:2005 (R;AU)
Describing the macroscopic world: Closing the circle within the dynamical reduction program, 20:1978 (R;XA)
Dissipative quantum mechanics: The generalization of the canonical quantization and von Neumann equation, 20:1989 (R;XA)
On Segal-Wilson's construction for the τ-functions of the constrained KP hierarchies, 20:1980 (R;XA)
Quantum symplectic geometry. 1. The matrix Hamiltonian formalism, 20:1990 (R;XA)
Recoil effects in quantum topological solitons, 20:1987 (R;XA)
Supersymmetry and Mathematics, 20:2065 (R;FR;In French)
Testing quantum behaviour at the macroscopic level, 20:1986 (R;XA)

QUARK MATERIAL
See QUARK MATTER

QUARK MATTER
An effective model of the quark-gluon plasma with thermal parton masses, 20:2082 (R;DE)
Critical parameters of Quark-Hadron phase transition with interacting and massive quarks, 20:2085 (R;XA)
Exclusive study of nuclear collisions at the AGS, 20:2272 (R;US)
Summary of heavy ion theory, 20:2233 (R;US)

QUARK MODEL
See also FLAVOR MODEL
STRING MODELS
Mass splitting of the pseudoscalar and vector mesons induced by the homogeneous vacuum gluon field, 20:2095 (R;XJ)

QUARK PLASMA
See QUARK MATTER

QUARK SEA
See QUARK MATTER

QUARK-GLUON PLASMA
See QUARK MATTER

QUARKS
A possible experimental determination of m_s/m-circumflex from $K_{\mu 4}$ decays, 20:2194 (R;FR)
Can the electric charges of elementary particles change with time?, 20:2200 (R;AU)
Light quark masses from exclusive tau decays: An experimental proposal, 20:2195 (R;FR)
Study of the simplest realistic Higgs sector in quark-lepton symmetric models, 20:2183 (R;AU)

QUARTZ
Analysis of experimentally shocked minerals by NMR spectroscopy, 20:1285 (R;US)

QUASI PARTICLES
See also ANYONS
PHONONS
PLASMONS
Quasiparticles in magnetized plasma, 20:2416 (R;UA)

QUASIPARTICLE-PHONON MODEL
One-phonon excitations in hot nuclei, 20:2220 (R;XJ;In Russian)

QUENCHING
Quench recovery processes associated with defect behaviour in YBCO near the critical temperature, 20:1183 (IA;AU)

QUINONE
See BENZOQUINONES

R

R (EXPOSURE UNIT)
See RADIATION DOSE UNITS

R CODES
RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3, 20:877 (R;US)

RACKS (FUEL)
See FUEL RACKS

RAD
See RADIATION DOSE UNITS

RADIATION ACCIDENTS
Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1, 20:353 (R;US)

RADIATION BURDEN
See RADIATION DOSES

RADIATION CHEMISTRY
Annual report 1992, 20:1418 (I;PL)

RADIATION DECONTAMINATION
See DECONTAMINATION

RADIATION DETECTION
Study and characterization of semi-conductor materials III-V for their applications to the ionizing radiation detection, 20:1627 (R;FR;In French)

RADIATION DETECTORS
See also DIELECTRIC TRACK DETECTORS
POSITION SENSITIVE DETECTORS
SEMICONDUCTOR DETECTORS
SHOWER COUNTERS
A micro-strip gas counter test with the RD20 front-end, 20:1653 (R;FR)
Calorimetric low-temperature detectors on semiconductor base for the energy-resolving detection of heavy ions, 20:1629 (R;DE;In German)
Experimental requirements for the study of electroweak gauge bosons, 20:1618 (RA;DE)
Machine, physics and detector (plus final focus) interplay at the next e^+e^- linear collider, 20:1620 (RA;DE)
Summary of evaporative cooling system for the SSC silicon tracker, 20:1649 (R;US)
Supertrack Monte Carlo variance reduction experience for non-Boltzmann tallies, 20:1650 (R;US)

RADIATION DOSE UNITS
New dose units in radiation protection, 20:1942 (R;DE;In German)

RADIATION DOSEMETERS
See DOSEMETERS

RADIATION DOSES
Benchmarking of computer codes and approaches for modeling exposure scenarios, 20:239 (R;US)
EPR spectroscopy as a tool for radiation exposure measurements on living animals in environment after nuclear contamination, 20:1402 (IA;PL)
Extension of Fakir, Kahina, a computer code of kinsfolk actinides heat irradiation neutron and activity, 20:188 (R;FR)
Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0, 20:218 (R;US)
Measurement of radiation dose with a PC-based instrument, 20:1944 (R;SE;In Swedish)
RESRAD benchmarking against six radiation exposure pathway models, 20:1906 (R;US)
Radiation in everyday life, 20:961 (I;XA)
Software program for a study and calculation of radiation, 20:2541 (IA;TH;In Thai)

Technical basis for beta skin dose calculations at the Y-12 Plant, 20:1947 (R;US)

RADIATION DOSIMETRY
See DOSIMETRY

RADIATION EXPOSURE (DOSES)
See RADIATION DOSES

RADIATION HARDENING (CHEMICAL)
See POLYMERIZATION

RADIATION HYGIENE
See RADIATION PROTECTION

RADIATION MONITORING
See also PERSONNEL MONITORING
Radiological control FY 1995 site support program plan WBS 6.7.2.4, 20:536 (R;US)

RADIATION PROTECTION
Convention on nuclear safety, 20:2574 (R;XA;In Arabic, Chinese, English, French)
Convention on nuclear safety. Final act, 20:2575 (R;XA;In Arabic, Chinese, English, French)
National arrangement to handle nuclear emergencies, 20:2578 (IA;PL)
New dose units in radiation protection, 20:1942 (R;DE;In German)
Nuclear and radiological safety, 1980-1993: International Atomic Energy Agency publications, 20:1918 (I;XA)
Pacific Northwest Laboratory annual report for 1993 to the DOE Office of Energy Research: Part 4: Physical sciences, 20:1941 (R;US)
Parameters affecting the calibration uniformity and traceability of gamma measuring devices, 20:1907 (R;EG)
Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey, 20:1910 (RA;US)
Radiation monitor calibration technique, 20:585 (IA;TH;In Thai)
Standardization in beta dosimetry, 20:584 (IA;TH;In Thai)

RADIATION SAFETY
See RADIATION PROTECTION

RADICALS
Conversion of free radicals upon annealing of x-irradiated single crystal of cholest-4-en-3-one, 20:1385 (IA;PL)
EPR investigations of iminoxy free radicals and paramagnetic metal-oxime systems, 20:1352 (IA;PL)

RADIO-RELEASE ANALYSIS
New continuous analysis for radio-release technique, 20:1307 (IA;TH;In Thai)

RADIOACTIVATION
Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)

RADIOACTIVE AEROSOLS
Hazard assessments of double-shell flammable gas tanks, 20:533 (R;US)
LLNL NESHAPs, 1993 annual report, 20:515 (R;US)
Pacific Northwest Laboratory facilities radionuclide inventory assessment CY 1992-1993, 20:298 (R;US)
Verification and validation of DEPOSITION 2.0, 20:1657 (R;US)

RADIOACTIVE BIOLOGICAL WASTES
See RADIOACTIVE WASTES

RADIOACTIVE EFFLUENTS
1993 Effluent and environmental monitoring report for the Bettis Atomic Power Laboratory, Pittsburgh Site, 20:468 (R;US)
Characterization and monitoring of 300 Area Facility liquid waste streams: Status report, 20:305 (R;US)
Nuclear power industry - activity discharges - occupational exposures. 1993, 20:1946 (R;SE;In Swedish)
Progress report on O2 research and development Mission 14: Columbia River studies, July–December 1966, 20:834 (R;US)

RADIOACTIVE GASEOUS WASTES
See GASEOUS WASTES
RADIOACTIVE WASTES

RADIOACTIVE ION BEAMS
A storage ring for radioactive beams, 20:1606 (R;US)
On the capabilities of present radioactive beam facilities, 20:1520 (R;FR)

RADIOACTIVE MATERIALS
See also FISSION PRODUCTS
RADIOACTIVE WASTES
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994, 20:475 (R;US)
Monitoring programme: Radioactive substances report for 1992, 20:1916 (I;GB)
New regulation of radioactive materials transport, 20:187 (R;FR;In French)
Predicting the pressure driven flow of gases through micro-capillaries and micro-orifices, 20:1442 (R;US)
User's guide for shipping Type B quantities of radioactive and fissile material, including plutonium, in DOT-6M specification packaging configurations, 20:190 (R;US)

RADIOACTIVE PARTICULATES
See RADIOACTIVE AEROSOLS

RADIOACTIVE WASTE DISPOSAL
Boreholes
VTT test borehole for bedrock investigations, 20:1841 (R;FI)
Bulgaria
Research procedure and criteria for analysis and choice of variants for construction of national radioactive waste repository, 20:278 (I;BG)
Contamination Regulations
Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal, 20:236 (R;US)
Demonstration Programs
Buried waste integrated demonstration FY 94 deployment plan, 20:498 (R;US)
Documentation
Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)
Economic Analysis
Buried waste integrated demonstration Fiscal Year 1993 close-out report, 20:266 (R;US)
Flowsheets
INEL Operable Unit 7-13 containment and stabilization configuration option, 20:263 (R;US)
Ground Water
Geochemical modelling of the groundwater at the Olkiluoto site, 20:1861 (R;FI)
Historical Aspects
Directions in low-level radioactive waste management: A brief history of commercial low-level radioactive waste disposal, 20:236 (R;US)
Program Management
Project report for the commercial disposal of mixed low-level waste debris, 20:260 (R;US)
Public Information
Environmental and health effects of various energy systems, 20:958 (I;XA)
Environmental and health effects of various energy systems, 20:943 (I;XA)
Remedial Action
Buried waste integrated demonstration FY 94 deployment plan, 20:498 (R;US)
Research Programs
Buried waste integrated demonstration Fiscal Year 1993 close-out report, 20:266 (R;US)
Risk Assessment
Leakage and accidental releases from Sillamaee waste depository and environmental risk assessment, 20:1859 (R;SE)
Safety Analysis
Quality assurance program plan for low-level waste at the WSCF Laboratory, 20:337 (R;US)
Site Characterization
Principles and criteria for creation of a concept for national radwaste repository, 20:277 (I;BG)

Site characterization progress report: Yucca Mountain, Nevada, October 1, 1993–March 31, 1994, 20:249 (R;US)

Systems Analysis
Research procedure and criteria for analysis and choice of variants for construction of national radioactive waste repository, 20:278 (I;BG)

Underground Disposal
Modular coupling of transport and chemistry: theory and model applications, 20:1833 (R;CH)

RADIOACTIVE WASTE FACILITIES
See also WIPP

Construction
Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment, 20:449 (R;US)
First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones, 20:319 (R;SE)

Decommissioning
B Plant cleanout and stabilization program update, 20:532 (R;US)
B Plant: WESF location study, 20:530 (R;US)

Design
Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste collection and transfer system upgrade for Building 3092 (central off-gas scrubber facility) at Oak Ridge National Laboratory, 20:245 (R;US)
Solid waste management complex site development plan, 20:364 (R;US)
Staff Technical Position on consideration of fault displacement hazards in geologic repository design, 20:292 (R;US)
WRAP 2A advanced conceptual design report comments, 20:359 (R;US)
Waste Receiving and Packaging, Module 2A, Supplemental Design Requirements Document, 20:360 (R;US)

Environmental Impacts
Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment, 20:449 (R;US)

Evaporators
95-1 Campaign evaporator boildown results, 20:382 (R;US)

Excavation
First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones, 20:319 (R;SE)

Financial Security
A process for establishing a financial assurance plan for LLW disposal facilities, 20:237 (R;US)

Fires
Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1, 20:353 (R;US)

Geochemistry
Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)

Geology
Geologic setting of the low-level burial grounds, 20:340 (R;US)

Hydrology
Evaluation of thermo-hydrological performance in support of the thermal loading systems study, 20:320 (R;US)
Geologic setting of the low-level burial grounds, 20:340 (R;US)
Progress report on the kinetic measurements of the reactions of the silicates at the Yucca Mountain potential repository site: [Final] report, June 15, 1993–September 30, 1993, 20:287 (R;US)

Information Needs
242-A Evaporator/Liquid Effluent Retention Facility data quality objectives, 20:383 (R;US)

Licensing Procedures
Model tracking system for low-level radioactive waste disposal facilities: License application interrogatories and responses, 20:567 (R;US)

Mechanical Structures
Engineering task plan for steam line ramp calculations, 20:399 (R;US)

Meetings
First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones, 20:319 (R;SE)

Modifications
Engineering task plan for steam line ramp calculations, 20:399 (R;US)

Nuclear Materials Management
SWEPP gamma-ray spectrometer system software user's guide, 20:258 (R;US)

Performance Testing
Acceptance test procedure for Project W-049H, 20:357 (R;US)
Phase III (full scale) agitated mixing test plan, 20:363 (R;US)

Pilot Plants
SWEPP gamma-ray spectrometer system software user's guide, 20:258 (R;US)

Radiation Accidents
Project W-026, Waste Receiving and Processing (WRAP) Facility Module 1: Maximum possible fire loss (MPFL) decontamination and cleanup estimates: Revision 1, 20:353 (R;US)

Remedial Action
Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method, 20:509 (R;US)
Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April–June, 1994, 20:1433 (R;US)
Test plan for core sampling drill bit temperature monitor, 20:534 (R;US)

Safety Analysis
Criticality safety evaluation for TRU waste in storage at the RWMC, 20:496 (R;US)

Site Approvals
Solid waste management complex site development plan, 20:364 (R;US)

Site Characterization
Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method, 20:509 (R;US)
Yucca Mountain Site Characterization Project: Technical Data Catalog (quarterly supplement), June 30, 1994, 20:248 (R;US)

Tanks
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)

Thermal Analysis
Evaluation of thermo-hydrological performance in support of the thermal loading systems study, 20:320 (R;US)

Tools
Aerosol can puncture device operational test plan, 20:356 (R;US)

Water Influx
A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory, 20:259 (R;US)

RADIOACTIVE WASTE MANAGEMENT
See also RADIOACTIVE WASTE DISPOSAL
RADIOACTIVE WASTE PROCESSING
RADIOACTIVE WASTE STORAGE
Radioactive waste management, 20:283 (IA;PL)

Administrative Procedures
Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)

Catalogs
Nuclear power, nuclear fuel cycle and waste management, 1980-1993: International Atomic Energy Agency publications, 20:2514 (I;XA)

Commercialization
FY-94 buried waste integrated demonstration program report, 20:235 (R;US)

Computer Codes
Methodology for evaluation of the reliability and safety of interim and final repositories for radioactive waste, 20:281 (I;BG)

Environmental Impacts
Treatment of M-area mixed wastes at the Savannah River Site, 20:230 (R;US)
Historical Aspects
Radioactive waste management information for 1993 and record-to-date, 20:234 (R;US)
Permit Applications
Resource Conservation and Recovery Act (RCRA) Part B Permit Application for Production Associated Units at the Oak Ridge Y-12 Plant, 20:446 (R;US)
Planning
Batching alternatives for Phase I retrieval wastes to be processed in WRAP Module 1, 20:354 (R;US)
Political Aspects
Workshop on establishing institutional credibility for SEAB Task Force on Radioactive Waste Management, 20:906 (R;US)
Program Management
Performance assessment task team progress report, 20:238 (R;US)
Resource Conservation and Recovery Act (RCRA) Part B permit application for container storage units at the Oak Ridge Y-12 Plant, 20:445 (R;US)
Public Information
Workshop on establishing institutional credibility for SEAB Task Force on Radioactive Waste Management, 20:906 (R;US)
Public Opinion
Workshop on establishing institutional credibility for SEAB Task Force on Radioactive Waste Management, 20:906 (R;US)
Radionuclide Migration
Methodology for evaluation of the reliability and safety of interim and final repositories for radioactive waste, 20:281 (I;BG)
Research Programs
FY-94 buried waste integrated demonstration program report, 20:235 (R;US)
Risk Assessment
Hanford Generic Interim Safety Basis, 20:341 (R;US)
Standardization
Performance assessment task team progress report, 20:238 (R;US)
Technology Transfer
Advances in technology transfer at Federal Facilities, 20:937 (R;US)
a Codes
Small job development software project documentation for the activity management system: Revision 1, 20:342 (R;US)

RADIOACTIVE WASTE PROCESSING
1994 Panel 1 Utilization Plan, 20:252 (R;US)
Dual shell pressure balanced reactor vessel: Final project report, 20:304 (R;US)
Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department, 20:294 (R;US)

RADIOACTIVE WASTE STORAGE
See also MONITORED RETRIEVABLE STORAGE
Certification
High level waste tank farm solid waste radionuclide smear sample and analysis plan, 20:438 (R;US)
Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)
Chemical Reactions
Synthetic waste chemical mechanism studies, 20:330 (R;US)
Containers
Electrochemical corrosion studies on a selected carbon steel for application in nuclear waste disposal containers: Influence of radiolytic products on corrosion in brines, 20:1153 (R;DE)
Historical Aspects
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)
Supporting document for the SW Quadrant Historical Tank Content Estimate for U-Tank Farm, 20:393 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for AX-tank farm, 20:386 (R;US)
Supporting document for the north east quadrant historical tank content estimate report for C-Tank Farm, 20:390 (R;US)
Manuals
Tank characterization reference guide, 20:418 (R;US)
Monitoring
B Plant low level waste system integrity assessment plan, 20:425 (R;US)
Performance indicators for 2nd quarter CY 1994, 20:497 (R;US)
Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)
Permit Applications
Resource Conservation and Recovery Act (RCRA) Part B permit application for container storage units at the Oak Ridge Y-12 Plant, 20:445 (R;US)
Risk Assessment
Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)
Safety
Tank 241-C-103 tank characterization plan, 20:421 (R;US)
Safety Analysis
CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground, 20:351 (R;US)
Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout, 20:329 (R;US)
Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1), 20:402 (R;US)
Hazard assessments of double-shell flammable gas tanks, 20:533 (R;US)
Solubility of ferrocyanide compounds: Ferrocyanide Safety Project, Interim report FY1994, 20:306 (R;US)
Safety Engineering
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II, 20:326 (R;US)
Structural analysis: Flexible receiver yoke brace for the 241SY101 mixer pump, 20:379 (R;US)
The effects of heating and dilution on the rheological and physical properties of Tank 241-SY-101 waste, 20:309 (R;US)
Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)
Specifications
Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification, 20:436 (R;US)
Stability
Evaluation of hydrogen buildup in radioactive mixed waste drums, 20:367 (R;US)

RADIOACTIVE WASTES
See also ALPHA-BEARING WASTES
HIGH-LEVEL RADIOACTIVE WASTES
LOW-LEVEL RADIOACTIVE WASTES
RADIOACTIVE EFFLUENTS
Cesium 137
Treatment of low-level radioactive cesium-137 and technetium-99 liquid wastes by inorganic ion-exchangers, 20:276 (I;TH;In Thai)
Chemical Analysis
242-A Evaporator waste analysis plan: Revision 4, 20:401 (R;US)
Evaluation of FTIR-based analytical methods for the analysis of simulated wastes, 20:420 (R;US)
Flammable gas safety program: Analytical methods development: FY 1994 progress report, 20:302 (R;US)
Interim data quality objectives for waste pretreatment and vitrification: Revision 1, 20:528 (R;US)
Low-level waste characterization plan for the WSCF Laboratory Complex, 20:336 (R;US)
Tank 241-C-103 tank characterization plan, 20:421 (R;US)

Chemical Composition
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)
Supporting document for the historical tank content estimate for A Tank Farm, 20:385 (R;US)
Supporting document for the historical tank content estimate for B Tank Farm, 20:387 (R;US)
Supporting document for the historical tank content estimate for BY Tank Farm, 20:389 (R;US)
Supporting document for the historical tank content estimate for S tank farm, 20:391 (R;US)
Chemical Reaction Kinetics
Evaluation of hydrogen buildup in radioactive mixed waste drums, 20:367 (R;US)
Compatibility
95-1 Campaign evaporator boildown results, 20:382 (R;US)
Decontamination
Magnetic separation for environmental remediation, 20:503 (R;US)
Environmental Transport
Research of documents pertaining to waste migration from leaking single-shell tanks, 20:472 (R;US)
Gaseous Wastes
Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994), 20:308 (R;US)
Hydraulic Fracturing
Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)
Inorganic Ion Exchangers
Treatment of low-level radioactive cesium-137 and technetium-99 liquid wastes by inorganic ion-exchangers, 20:276 (I;TH;In Thai)
Nondestructive Analysis
SWEPP Gamma-Ray Spectrometer System software design description, 20:257 (R;US)
Nuclear Materials Management
Bar-code automated waste tracking system, 20:556 (R;US)
Oxidation
Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)
Packaging
The acceptance, before transport, of the waste radioactive packages on the disposal facilities of ANDRA, 20:275 (IA;JP)
Pollution Abatement
B Plant Complex pollution prevention plan: Revision 1, 20:400 (R;US)
Public Opinion
Public values related to decisions in the Tank Waste Remediation System Program, 20:301 (R;US)
Radiation Monitoring
Hanford Site ground-water monitoring for 1993, 20:466 (R;US)
Radioactive Waste Processing
Reduction of nitrate and nitrite salts under hydrothermal conditions, 20:290 (R;US)
Radioactive Waste Storage
Supporting Document for the SW Quadrant Historical Tank Content Estimate for SX-Tank Farm, 20:392 (R;US)
Supporting document for the North East Quandrant Historical Tank Content Estimate Report for BX-Tank Farm, 20:388 (R;US)
Vapor space characterization of Waste Tank 241-C-103: Inorganic results from sample Job 7B (May 12-25, 1994), 20:308 (R;US)
Radioassay
SWEPP gamma-ray spectrometer system software user's guide, 20:258 (R;US)
Remote Handling
One-trip drum operating instruction, 20:352 (R;US)
Remote automated material handling of radioactive waste containers, 20:333 (R;US)
Removal
Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V), 20:504 (R;US)
Rheology
Software quality assurance plan for viscometer, 20:407 (R;US)
Sampling
Interim data quality objectives for waste pretreatment and vitrification: Revision 1, 20:528 (R;US)
Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department, 20:294 (R;US)
Tank 241-C-103 tank characterization plan, 20:421 (R;US)
Solidification
Method for treating materials for solidification, 20:296 (PA;US)
Sorting
Performance report for a small package counter that uses active neutron interrogation, 20:559 (R;US)
Technetium 99
Treatment of low-level radioactive cesium-137 and technetium-99 liquid wastes by inorganic ion-exchangers, 20:276 (I;TH;In Thai)
Testing
Road Transportable Analytical Laboratory (RTAL) System: Quarterly technical report, March 1993–May 1993, 20:1788 (R;US)
Underground Disposal
Reduction of nitrate and nitrite salts under hydrothermal conditions, 20:290 (R;US)
Underground Storage
241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:369 (R;US)
241-AV/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:371 (R;US)
Closure certification report for the Bear Creek burial grounds B area and walk-in pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, 20:444 (R;US)
Public values related to decisions in the Tank Waste Remediation System Program, 20:301 (R;US)
TWRS corrosion monitoring program plan, 20:403 (R;US)
Waste Tank Organic Safety Program: Analytical methods development: Progress report, FY 1994, 20:303 (R;US)
Vacuum Distillation
95-1 Campaign evaporator boildown results, 20:382 (R;US)
Vitrification
Effects of glass surface area-to-solution volume ratio (S/V) on glass dissolution: Part one: Relationship between S/V and leachate pH, 20:217 (R;US)
Feasibility study for the processing of Hanford Site cesium and strontium isotopic sources in the Hanford Waste Vitrification Plant, 20:323 (R;US)
Tank Waste Remediation System Projects Document Control Plan, 20:409 (R;US)
Void Fraction
Software quality assurance plan for void fraction instrument, 20:408 (R;US)
Waste Retrieval
Feasibility study of tank leakage mitigation using subsurface barriers, 20:529 (R;US)
Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)
X-Ray Radiography
Nondestructive examination development and demonstration plan, 20:355 (R;US)

RADIOACTIVITY
Application of radioactivity in clinical analysis by radioimmunoassay technique, 20:1883 (IA;TH;In Thai)

RADIOAUTOGRAPHY
See AUTORADIOGRAPHY

RADIOBIOLOGY
Radiation physics, biophysics, and radiation biology: Progress report, December 1, 1993–November 30, 1994, 20:1912 (R;US)

RADIOCARBON DATING
See ISOTOPE DATING

RADIOCHEMICAL ANALYSIS
Radiochemistry methods in DOE methods for evaluating environmental and waste management samples, 20:1334 (R;US)

RADIOCHEMISTRY
See also HOT ATOM CHEMISTRY
Radiochemical control of disida kit, 20:1416 (IA;TH;In Thai)
Summer schools in nuclear chemistry: Final progress report, February 15, 1991–February 14, 1992, 20:1410 (R;US)

RADIODIAGNOSIS (RADIONUCLIDES)
See NUCLEAR MEDICINE

RADIOFREQUENCY SYSTEMS
See RF SYSTEMS

RADIOGRAPHY (AUTO)
See AUTORADIOGRAPHY

RADIOGRAPHY (BIOMEDICAL)
See BIOMEDICAL RADIOGRAPHY

RADIOGRAPHY (INDUSTRIAL)
See INDUSTRIAL RADIOGRAPHY

RADIOISOTOPE HEAT SOURCES
Monthly progress report heat source technology programs, June 1994, 20:612 (R;US)

RADIOISOTOPE MIGRATION
See RADIONUCLIDE MIGRATION

RADIOISOTOPE-LABELLED DRUGS
See RADIOPHARMACEUTICALS

RADIOISOTOPES
Autoradiographic studies of ^{65}Zn adsorption by periphyton, 20:1908 (R;US)
Carbon-14 in the marine environment of the gulf of Thailand, 20:1852 (IA;TH;In Thai)
Cesium-137 in the marine environment of the gulf of Thailand, 20:1851 (IA;TH;In Thai)
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)
Specific activities and DOE-STD-1027-92 hazard Category 2 thresholds, LANL fact sheet, 20:502 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1, 20:241 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1, 20:241 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)
Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G, 20:543 (R;US)

RADIOLOGICAL PERSONNEL
Industrial radiography, 20:1483 (I;GB)

RADIOLOGICAL PROTECTION
See RADIATION PROTECTION

RADIOLYSIS
Acetone
Pulse radiolysis of acetonic solutions in presence of silver salts, 20:1406 (IA;PL)
Alanine-L
High-LET radiolysis. Pt.3. Crystalline α-L-alanine irradiated on ^{12}C and ^{25}Mg ion beams, 20:1405 (IA;PL)
Amino Acids
Pulse radiolysis studies of short-lived species in solid amino acids as precursors of radicals detected by ESR, 20:1386 (IA;PL)
Chemical Dosemeters
High-LET radiolysis. Pt.1. A facility and its testing, 20:1403 (IA;PL)
Cross-Linking
Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules, 20:1390 (IA;PL)
Crown Ethers
Radiation stability of crown ether - metal ions complexes, 20:1389 (IA;PL)
Cysteine
An ESR study of sulfur-containing amino acids in aqueous frozen solution, 20:1393 (IA;PL)
Dimethyl Sulfide
Reactivity of halogenorganic radicals in DMSO solution, 20:1400 (IA;PL)
Dna
ESR studies of radiation damage of DNA and proteins, 20:1387 (IA;PL)
Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules, 20:1390 (IA;PL)
Early Radiation Effects
Spurs in solids, 20:1407 (IA;PL)
G Value
High-LET radiolysis. Pt.2. To "oxygen in heavy ion track hypothesis", 20:1404 (IA;PL)
Glutaric Acid
ENDOR study of free radicals in X-irradiated glutarimide, 20:1392 (IA;PL)
Imides
ENDOR study of free radicals in X-irradiated glutarimide, 20:1392 (IA;PL)
Let
High-LET radiolysis. Pt.1. A facility and its testing, 20:1403 (IA;PL)
High-LET radiolysis. Pt.2. To "oxygen in heavy ion track hypothesis", 20:1404 (IA;PL)
Local Radiation Effects
Spurs in solids, 20:1407 (IA;PL)
Methionine
An ESR study of sulfur-containing amino acids in aqueous frozen solution, 20:1393 (IA;PL)
Organic Halogen Compounds
Reactivity of halogenorganic radicals in DMSO solution, 20:1400 (IA;PL)
Organic Sulfur Compounds
Photochemical and radiation-chemical aspects of matrix acidity effects on organic sulphur compounds, 20:1401 (IA;PL)
Oxygen Enhancement Ratio
High-LET radiolysis. Pt.2. To "oxygen in heavy ion track hypothesis", 20:1404 (IA;PL)
Peptides
An ESR study of gamma irradiated polycrystalline methionine-containing peptides, 20:1399 (IA;PL)
ESR study of radiation induced radicals in solid peptides, 20:1394 (IA;PL)
Phenols
ESR and pulse radiolysis on the free-radical-induced oxidation of phloroglucinol in aqueous solution, 20:1388 (IA;PL)
Polymers
Pulsed NMR studies; T_2 relaxation and physical properties of macromolecules, 20:1390 (IA;PL)
Proteins
ESR studies of radiation damage of DNA and proteins, 20:1387 (IA;PL)
Radicals
High-LET radiolysis. Pt.3. Crystalline α-L-alanine irradiated on ^{12}C and ^{25}Mg ion beams, 20:1405 (IA;PL)
Reaction Intermediates
An ESR study of gamma irradiated polycrystalline methionine-containing peptides, 20:1399 (IA;PL)
Dispersive kinetics of radiation-induced species in condensed media, 20:1391 (IA;PL)
ESR studies of the generations and reactions of free radicals in chemical and biochemical systems, 20:1384 (IA;PL)
Photochemical and radiation-chemical aspects of matrix acidity effects on organic sulphur compounds, 20:1401 (IA;PL)
Pulse radiolysis of acetonic solutions in presence of silver salts, 20:1406 (IA;PL)
Reactivity of halogenorganic radicals in DMSO solution, 20:1400 (IA;PL)
Reaction Kinetics
Dispersive kinetics of radiation-induced species in condensed media, 20:1391 (IA;PL)

Scavenging
ESR studies of the generations and reactions of free radicals in chemical and biochemical systems, 20:1384 (IA;PL)
RADIOMETRIC GAGES
Isotopic density gauge of ceramic bodies, 20:605 (IA;PL)
RADIONUCLIDE CONCENTRATION
See RADIOACTIVITY
RADIONUCLIDE MIGRATION
A two-dimensional simulation of tritium transport in the vadose zone at the Nevada Test site, 20:1850 (R;US)
Elementary migration around the Oklo nuclear reactors. Implications for high level radioactive wastes storage, 20:1774 (R;FR;In French)
GWSCREEN: A semi-analytical model for assessment of the groundwater pathway from surface or buried contamination: Theory and user's manual, Version 2.0: Revision 2, 20:1794 (R;US)
INTRAVAL Working group 2 summary report on Phase 2 analysis of the Finnsjoen test case, 20:1838 (R;SE)
Methodology for evaluation of the reliability and safety of interim and final repositories for radioactive waste, 20:281 (I;BG)
Radionuclide migration from shallow land disposal site, 20:1800 (IA;TH;In Thai)
RADIONUCLIDE TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION
RADIONUCLIDES
See RADIOISOTOPES
RADIOPHARMACEUTICALS
Nuclear medicine. Czech special bulletin. No. 2, 20:1880 (I;CZ;In Czech)
Potential for the development and manufacture of radiopharmaceutical kits, 20:1413 (IA;CZ;In Czech)
Radiopharmaceuticals for diagnosis: Final report, 20:1873 (R;US)
RADIOPOLYMERIZATION
See POLYMERIZATION
RADIORESISTANCE
See RADIOSENSITIVITY
RADIOSENSITIVITY
Age-dependence of susceptibility, 20:1927 (RA;JP;In Japanese)
Metabolism of arachidonic acid in murine lymphoma L5178Y sublines radiation resistant of sensitive to ionizing radiation, 20:1923 (IA;PL)
Reduced sensitivity to camptothecin of L5178Y sublines is accompanied by diminished DNA damage, 20:1921 (IA;PL)
Sensitivity to inhibitors of type II topoisomerase from mouse L5178Y lymphoma sublines: Resistant and sensitive to X radiation, 20:1922 (IA;PL)
Track structure analysis of survival of two mouse lymphoma L5178Y cell strains of different radiation sensitivity, 20:1920 (IA;PL)
RADIOSURGERY
See RADIOTHERAPY
RADIOTHERAPY
A therapy level α-alanine dosimetry, 20:1887 (IA;PL)
Medical facility for radiation therapy with JINR proton phasotron beams, 20:1888 (R;XJ)
The application of nuclear technology in cancer radiotherapy, 20:1885 (IA;PL)
RADIUM 226
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)
RADIUM ADDITIONS
See ALLOYS
RADIUM SILICATES
See SILICATES
RADON
Exposure to radon and radon progeny in the indoor environment: Final report, 20:1707 (R;US)
Investigations of radon indoors and on building sites: Radiation protection - Booklet 3, 20:1769 (R;NO;In Norwegian)
Navy radon assessment and mitigation program: Final report, 20:1740 (R;US)
Radon discrimination for work place air samples, 20:471 (R;US)
RADON 220
Transport of radon and thoron at the Earth's surface: Final report, April 1, 1988–June 30, 1994, 20:1706 (R;US)
RADON 222
Concentrations of dissolved radon-222 in water from selected wells and springs in Idaho, 1989-91, 20:1784 (R;US)
RADURIZATION
Studies on the detection of radiation treated foodstuffs by the EPR spectroscopy, 20:1395 (IA;PL)
RAMAN SPECTROSCOPY
Single-collision studies of energy transfer and chemical reaction: Performance report, September 9, 1991–April 15, 1994, 20:1344 (R;US)
RAPSODIE REACTOR
Fluid structure interaction in L.M.F.B.R. cores. Flowering response to an impulse load, 20:789 (R;FR)
RARE EARTH COMPOUNDS
Magnetism of lanthanide intermetallic compounds, 20:1221 (IA;PL)
Methods and opportunities in the recycling of rare earth based materials, 20:1144 (R;US)
RARE EARTHS
See also GADOLINIUM
A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
Covalency of scandium(III) as manifested in the enthalpies of solution of anhydrous rare earth halides, 20:1359 (IA;PL)
RARE GASES
See also ARGON
HELIUM
RADON
XENON
Wetting transitions of classical liquid films: A nearly universal trend, 20:2023 (R;FR)
RAW MATERIALS
Raw material conservation report of Lower Saxony 1993, 20:1019 (I;DE;In German)
RCIC SYSTEMS
The effects of aging on BWR core isolation cooling systems, 20:878 (R;US)
REACTION INTERMEDIATES
OH radicals induced oxidation of sulfur-containing amino acids. An ESR study, 20:1397 (IA;PL)
Pulse radiolysis studies of short-lived species in solid amino acids as precursors of radicals detected by ESR, 20:1386 (IA;PL)
Reactivity of halogenorganic radicals in DMSO solution, 20:1400 (IA;PL)
REACTION KINETICS
See also CHEMICAL REACTION KINETICS
Behaviour of the reaction front for $A + B \rightarrow C$ diffusion-reactions systems: An analytic approach, 20:2012 (R;XA)
REACTION MECHANISMS
See REACTION KINETICS
REACTION RATE
See REACTION KINETICS
REACTOR ACCIDENTS
See also LOSS OF COOLANT
REACTOR CORE DISRUPTION
A synthesis of hydrogen behaviour in severe reactor accidents, 20:766 (R;FI)
Incidents that require emergency operating procedures, 20:872 (R;US)
Interfacial friction in low flowrate vertical annular flow, 20:1465 (R;FR)
Loss of residual heat removal during mid-loop operation: Bethsy experiments, 20:758 (R;FR)
PWR accident management realated tests: some Bethsy results, 20:757 (R;FR)
RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3, 20:877 (R;US)
REACTOR CHARGING MACHINES
100-N technical manual: Volume 2A: Systems descriptions, 20:826 (R;US)

REACTOR COMPONENTS
See also CONTROL ELEMENTS
FUEL ELEMENTS
REACTOR CHARGING MACHINES
REACTOR COOLING SYSTEMS
REACTOR CORES
Issues and approaches in risk-based aging analyses of passive components, 20:871 (R;US)
Report of material and equipment section's activities at New York Shipbuilding Corp. during fabrication of AXC 167 1/2 starting May 18, 1951: Part 9, Section 1 and 2, 20:868 (R;US)

REACTOR CONTROL RODS
See CONTROL ELEMENTS

REACTOR CONTROL SYSTEMS
100-N technical manual: Volume 2A: Systems descriptions, 20:826 (R;US)

REACTOR CONTROL THEORY
See REACTOR KINETICS

REACTOR COOLING SYSTEMS
See also PRIMARY COOLANT CIRCUITS
RCIC SYSTEMS
Afterheat removal for HTR-10 test module under accident conditions, 20:775 (RA;XA)
Passive decay and residual heat removal in the MHTGR, 20:777 (RA;XA)
The low pressure critical flow behavior of steam-water mixtures in constant area flow passages, 20:857 (R;US)

REACTOR CORE DISRUPTION
Precursors to potential severe core damage accidents: 1993, A status report: Volume 20: Appendices E and F, 20:876 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 19: Main report and appendices A–D, 20:875 (R;US)

REACTOR CORE ISOLATION COOLING
See RCIC SYSTEMS

REACTOR CORES
Review of the main results of source terms studies under core melting conditions, 20:833 (R;EG)
Technical design criteria – PRTR high power density core, 20:858 (R;US)

REACTOR DECOMMISSIONING
A RWMAC commentary on the Science Policy Research Unit report: UK nuclear decommissioning policy: time for decision, 20:808 (I;GB)

REACTOR DISMANTLING
Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)
Gamma camera prototype for nuclear installation dismantling, 20:741 (R;FR;In French)

REACTOR FUEL ELEMENTS
See FUEL ELEMENTS

REACTOR FUELS
See NUCLEAR FUELS

REACTOR KINETICS
Nuclear reactor kinetics, 20:829 (IA;EG)
Validation of the reactor dynamics code HEXTRAN, 20:767 (R;FI)

REACTOR MAINTENANCE
A few guidelines for improving the operating safety of nuclear power plants, 20:2472 (RA;XA)
Guidance for the design and management of a maintenance plan to assure safety and improve the predictability of a DOE nuclear irradiation facility: Final report, 20:882 (R;US)
Training related activities, 20:2494 (RA;XA)

REACTOR MATERIALS
See also NUCLEAR FUELS
Effect of neutron irradiation on the impact properties of A533B steel, 20:1162 (R;US)
Feasibility of a novel approach for fast, economical determination of radiation damage in nuclear reactor cores: Progress report, [November 1, 1993–October 31, 1994], 20:807 (R;US)
Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)

REACTOR MONITORING SYSTEMS
100-N technical manual: Volume 2A: Systems descriptions, 20:826 (R;US)
Cooperative research and development for artificial intelligence based reactor diagnostic system, 20:820 (R;US)
Project 8980, Savannah River Plant, 105-C power calculator, 20:825 (R;US)

REACTOR OPERATORS
Behavior
Conception to create the system for psychophysiological maintenance of operators' labor in power plants, 20:2484 (RA;XA)

Decision Making
Cooperative research and development for artificial intelligence based reactor diagnostic system, 20:820 (R;US)

Meetings
Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993, 20:827 (R;XA)
Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993, 20:828 (R;XA)

Training
Atucha 1 Nuclear Power Station, 20:2464 (RA;XA)
Education and training program at Hamaoka Nuclear Power Station, 20:2478 (RA;XA)
Finnish programme and experience on training and qualification for nuclear power plant personnel, 20:2471 (RA;XA)
German system for training and qualification of NPP-personnel, 20:2474 (RA;XA)
National programme and experience on training and qualification for nuclear plant personnel, 20:2465 (RA;XA)
Preparation and conduct of simulator training in Germany, 20:2476 (RA;XA)
Programme and experience on training and qualification for nuclear power plant personnel in China, 20:2469 (RA;XA)
Russian programme and experience on nuclear power plant personnel training system development, 20:2481 (RA;XA)
Spanish national programme and experience on training and qualification for nuclear power plant personnel, 20:2482 (RA;XA)
Survey of programme and experience on training and qualification for nuclear power plant personnel in Belgium, 20:2466 (RA;XA)
System for training and qualification of nuclear power plant personnel in Pakistan, 20:2480 (RA;XA)
The Czech Republic Nuclear Power Programme present situation and its development, 20:2470 (RA;XA)
The German center for the simulator training of nuclear power plant personnel, 20:2475 (RA;XA)
The UK programme and experience on training and qualification for nuclear power plant personnel, 20:2485 (RA;XA)
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2468 (RA;XA)
The training and qualification of nuclear power plant operations personnel in Canada. A regulatory overview, 20:2498 (RA;XA)
Training and qualification of nuclear power plant personnel in Brazil, 20:2467 (RA;XA)
Training for qualification and competence of nuclear power plant personnel in India, 20:2477 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel in the United States, 20:2486 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel in Mexico, 20:2479 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel in Sweden, 20:2483 (RA;XA)
Training for the qualification and competence of nuclear power plant personnel. Working material: Report of an IAEA review meeting held in Vienna, 22-26 February 1993, 20:827 (R;XA)
Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former

Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993, 20:828 (R;XA)

REACTOR PHYSICS
Proceedings of the symposium on the physics and technology of reactors, 20:861 (I;EG)

REACTOR PROTECTION SYSTEMS
Ageing study of protection automation components of Olkiluoto nuclear power plant, 20:754 (R;FI;In Finnish)

REACTOR SAFETY
Cooperation with CIS in training of NPP-Personnel. (Supported by German Government and European Community), 20:2500 (RA;XA)
Implementation of systematic training approach in Kozloduy Training Centre - Current situation. Presentation of Bulgaria, 20:2496 (RA;XA)
Presentation of the G-24 technical working group on training, 20:2495 (RA;XA)
Reliability analysis of software based safety functions, 20:747 (R;FI;In Finnish)
Safety system of nuclear power plants and its management example, 20:957 (I;XA)
Seismic design and analysis methods, 20:764 (R;FI;In Finnish)
Training related activities, 20:2494 (RA;XA)

REACTOR SHUTDOWN
Loss of residual heat removal during mid-loop operation: Bethsy experiments, 20:758 (R;FR)

REACTOR SIMULATORS
Real-time dynamic simulator for the Topaz II reactor power system, 20:792 (R;US)

REACTOR STABILITY
Analysis of reactor power oscillation based on nonlinear dynamic theory, 20:749 (R;JP;In Japanese)

REACTOR TECHNOLOGY
Training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union. Working material: Report of an IAEA technical co-operation meeting held in Vienna, 11-15 October 1993, 20:828 (R;XA)

REACTORS
See also GAS COOLED REACTORS
PRODUCTION REACTORS
WATER COOLED REACTORS
Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Feasibility of a novel approach for fast, economical determination of radiation damage in nuclear reactor cores: Progress report, [November 1, 1993–October 31, 1994], 20:807 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)
Training Program Handbook: A systematic approach to training, 20:2455 (R;US)

REAL TIME SYSTEMS
Highly reliable computer network for real time system, 20:821 (R;EG)

RECOIL CHEMISTRY
See HOT ATOM CHEMISTRY

RECORDS RETRIEVAL
See INFORMATION RETRIEVAL

RECYCLE (FUEL)
See FUEL CYCLE

REDMUD EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

REDUCTION
New type three way catalyst for automobiles, 20:1085 (IA;JP;In Japanese)
Three way catalyst for advanced lean burn engine, 20:1086 (IA;JP;In Japanese)

REENTRY VEHICLES
Roll control resonance test vehicle (RCRTV) system postflight evaluation report, 20:1034 (R;US)
SPINFIN: A computer program for trajectory simulation of flight vehicles with semi-passive roll control systems, 20:1686 (R;US)

REFLECTIVE COATINGS
Determination of thin film optical constants using variable angle reflectance, 20:1275 (IA;AU)
Multilayer thin film colour selective filters, 20:1276 (IA;AU)

REFRIGERANTS
Thermophysical properties of HFC-143a and HFC-152a: Final report, April 1, 1993–June 30, 1994, 20:1243 (R;US)

REFUSE
See SOLID WASTES

REGION I
See USA

REGION II
See USA

REGION III
See USA

REGION IV
See USA

REGION IX
See USA

REGION V
See USA

REGION VI
See USA

REGION VII
See USA

REGION VIII
See USA

REGION X
See USA

REINLUFT PROCESS
See DESULFURIZATION

RELATIVITY THEORY
Incompatibility of the generally accepted definition of a moving scale length with interval Lorentz invariance, 20:1975 (R;XJ)

RELAXATION LOSSES
Elimination of multiple quantum artifacts in 2D COSY NMR spectra (EMA-COSY), 20:2284 (IA;AU)
Model of electronic energy relaxation in the test-particle Monte Carlo method, 20:148 (R;FR)

RELAYS
Characteristics and development report for the MC3994 and MC3994A relays, 20:1504 (R;US)

RELIEF VALVES
Periodic testing of safety valves of nuclear facilities: Bases, procedures and requirements, 20:1450 (R;FI;In Finnish)

REM
See RADIATION DOSE UNITS

REMEDIAL ACTION
Drilling Equipment
Phase I ResonantSonic CRADA report, 20:1496 (R;US)
Feasibility Studies
Preliminary site characterization - final report, 20:442 (R;US)
Health Hazards
Environmental Hazards Assessment Program: Quarterly report, July 1994–September 1994, 20:916 (R;US)
Planning
Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness, 20:912 (RA;US)
The UMTRA Project process and framework for execution, 20:481 (RA;US)
Pollution Regulations
RCRA corrective action & CERCLA remedial action reference guide, 20:913 (R;US)
Program Management
A team leadership approach to managing the transition from construction to operations for an environmental project, 20:521 (R;US)
CERCLA site assessment workbook, Volume 1, 20:233 (R;US)
Defining the role of risk assessment in the Comprehensive Environmental Response, Compensation, and Liability Act

(CERCLA) remedial investigation process at the DOE-OR, 20:499 (R;US)

Remote Viewing Equipment
Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April–June, 1994, 20:1433 (R;US)

Research Programs
Integrated demonstrations, integrated programs, and special programs within DOE's Office of Technology Development, 20:922 (R;US)

Risk Assessment
Defining the role of risk assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation process at the DOE-OR, 20:499 (R;US)
Environmental Hazards Assessment Program: Quarterly report, July 1994–September 1994, 20:916 (R;US)

Safety Analysis
Test plan for FY-94 digface characterization field experiments, 20:270 (R;US)

Site Characterization
CERCLA site assessment workbook, Volume 1, 20:233 (R;US)
Remedial investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendixes, 20:495 (R;US)

Systems Analysis
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary, 20:518 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report, 20:519 (R;US)

Technology Transfer
Chemical sciences, annual report 1993, 20:1365 (R;US)

Waste Management
Waste management plan for the remedial investigation of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:507 (R;US)

Waste Storage
Final environmental assessment and Finding-of-No-Significant-Impact - drum storage facility for interim storage of materials generated by environmental restoration operations, 20:232 (R;US)

REMOTE HANDLING EQUIPMENT
See also MANIPULATORS
Advanced robotic technologies for transfer at Sandia National Laboratories, 20:1448 (R;US)
One-trip drum operating instruction, 20:352 (R;US)
PUREX irradiated fuel recovery simulation, 20:186 (R;US)
Project W-320 Heel Jet Secondary Catch Mechanism lateral load test, 20:1458 (R;US)
Test procedure forms for sludge retrieval and packaging, 20:349 (R;US)
Usability testing of the human-machine interface for the Light Duty Utility Arm System, 20:1457 (R;US)

REMOTE VIEWING EQUIPMENT
Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994, 20:189 (R;US)
Interactive Computer-Enhanced Remote Viewing System: Quarterly report number 6, April–June, 1994, 20:1433 (R;US)
Structural analysis of color video camera installation on tank 241AW101 (2 Volumes), 20:380 (R;US)

REMOVAL (AFTER-HEAT)
See AFTER-HEAT REMOVAL

RENEWABLE ENERGY SOURCES
See also BIOMASS
GEOTHERMAL ENERGY
HYDROELECTRIC POWER
SOLAR ENERGY
Energy conservation at the customer's: Financial support models of municipal utility companies, 20:971 (I;DE;In German)
Net energy analysis of different electricity generation systems, 20:796 (R;XA)
Perennial grass production for biofuels: Soil conversion considerations, 20:630 (R;US)
Possibility of introducing new energy technologies to the South Pacific island countries, 20:1000 (R;JP;In Japanese)
Travel to Japan for discussion on renewable energy projects: Foreign trip report, February 9–March 4, 1994, 20:614 (R;US)

REPUBLIC OF KOREA
Current status of spent fuel management in the Republic of Korea and design concept of the interim spent fuel storage facility, 20:201 (RA;XA)

RESEARCH PROGRAMS
FEDIX: User's guide, Version 5.0/Release 3.0, 20:2568 (R;US)
Partnering with Sandia National Laboratories through alliances or consortia, 20:936 (R;US)
Robotic Manufacturing Science and Engineering Laboratory (RMSEL), 20:1041 (R;US)
Special initiatives FY 1995 Multi-Year Program Plan (MYPP)/Fiscal Year Work Plan (FYWP) WBS 5.0, 20:938 (R;US)
The United States Department of Energy Office of Industrial Technology's Technology Benefits Recording System, 20:931 (R;US)

RESEARCH REACTORS
See also ETRR-1 REACTOR
FFTF REACTOR
HIFAR REACTOR
MOATA REACTOR
NSRR REACTOR
OSIRIS REACTOR
PCTR REACTOR
PRTR REACTOR
FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results, 20:863 (R;US)
Guidance for the design and management of a maintenance plan to assure safety and improve the predictability of a DOE nuclear irradiation facility: Final report, 20:882 (R;US)

RESERVOIR ROCK
Innovative techniques for the description of reservoir heterogeneity using tracers: Final report, October 1992–December 1993, 20:95 (R;US)
Laboratory investigation of constitutive property scaling behavior, 20:105 (R;US)

RESERVOIRS (WATER)
See WATER RESERVOIRS

RESIDENCES
See HOUSES

RESIDENTIAL BUILDINGS
See also HOUSES
Building Technologies Program, 1993 annual report, 20:1025 (R;US)
Energy Analysis Program, 1993 annual report, 20:1023 (R;US)
The North Carolina Field Test: Field performance of the preliminary version of an advanced weatherization audit for the Department of Energy's Weatherization Assistance Program, 20:1029 (R;US)

RESIDENTIAL SECTOR
Estimating household fuel oil/kerosine, natural gas, and LPG prices by census region, 20:997 (R;US)
Survey on the actual energy consumption status for the residential/economical use, 20:998 (R;JP;In Japanese)

RESIDUAL PETROLEUM
An evaluation of known remaining oil resources in the United States: Appendix, Project on Advanced Oil Recovery and the States, 20:106 (R;US)
An evaluation of known remaining oil resources in the United States: Project on advanced oil recovery and the states: Volume 1, 20:107 (R;US)
An evaluation of known remaining oil resources in the state of Kansas and Oklahoma: Volume 5, Project on Advanced Oil Recovery and the States, 20:110 (R;US)
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)

An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)
Removal of organic scales and processing of tertiary oil. Pt. 1: Removal of organic scales in watered-down wet oil probes, 20:121 (R;DE;In German)
Removal of organic scales and processing of tertiary oil. Pt. 2: Effects of wet oil produced by enhanced recovery techniques on the production and processing systems, 20:124 (R;DE;In German)

RESIDUES
See also ASHES
Deashing of coal liquids by sonically assisted filtration, 20:48 (R;US)

RESIDUES (RADIOACTIVE)
See RADIOACTIVE WASTES

RESISTAL
See COPPER BASE ALLOYS

RESONANCE STATES
See ENERGY LEVELS

RESOURCE ASSESSMENT
U.S. crude oil, natural gas, and natural gas liquids reserves - 1993 annual report, 20:101 (R;US)

RESOURCE RECOVERY ACTS
RCRA corrective action & CERCLA remedial action reference guide, 20:913 (R;US)
Resource Conservation and Recovery Act (RCRA) contingency plan for hazardous waste treatment, storage, and disposal units at the Oak Ridge Y-12 Plant, 20:546 (R;US)

RESOURCES
See also GEOTHERMAL RESOURCES
U.S. crude oil, natural gas, and natural gas liquids reserves - 1993 annual report, 20:101 (R;US)

RESPIRABLE DUSTS
See DUSTS

RETORTED SHALES
See SPENT SHALES

RETORTS
The development of an integrated multistage fluid-bed retorting process: Quarterly report, April–June, 1994, 20:140 (R;US)

REWETTING
The top-down reflooding model in the Cathare code, 20:761 (R;FR)

RF SYSTEMS
High-power RF window design for the PEP-II B Factory, 20:1614 (R;US)
RF feedback simulation for the PEP-II B Factory, 20:1593 (R;US)
RF system design for the PEP-II B Factory, 20:1610 (R;US)

RHENIUM COMPLEXES
Excited state processes in transition metal complexes. Redox splitting in soluble polymers: Progress report, July 15, 1993–July 14, 1994, 20:1374 (R;US)

RHO-765 RESONANCES
See RHO-770 MESONS

RHO-770 MESONS
Zero sound velocity in π, ρ mesons at different temperatures, 20:2088 (R;XA)

RICHLAND FFTF REACTOR
See FFTF REACTOR

RICHLAND NPR REACTOR
See N-REACTOR

RICHLAND PHYSICAL CONSTANTS TEST REACTOR
See PCTR REACTOR

RIEMANN CURVATURE TENSOR
See RIEMANN SPACE

RIEMANN FUNCTION
Statistical properties of the zeros of zeta functions - beyond the Riemann case, 20:1993 (R;FR)

RIEMANN GEOMETRY
See RIEMANN SPACE

RIEMANN MANIFOLDS
See RIEMANN SPACE

RIEMANN METRIC
See RIEMANN SPACE

RIEMANN SPACE
Trace formula for Riemann surfaces with magnetic field, 20:1992 (R;FR)

RIEMANN SPHERE
See RIEMANN SPACE

RIEMANN WAVES
See SHOCK WAVES

RILEY-MORGAN PROCESS
See COAL GASIFICATION

RINGS (STORAGE)
See STORAGE RINGS

RIO GRANDE RIFT
Fractal nature and scaling of normal faults, Rio Grande rift, NM: Implications for growth and strain, 20:1972 (R;US)

RISER CRACKING
See COAL LIQUEFACTION

RISK ANALYSIS
See RISK ASSESSMENT

RISK ASSESSMENT
Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness, 20:912 (RA;US)
Defining the role of risk assessment in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedial investigation process at the DOE-OR, 20:499 (R;US)
Proceedings of workshop I in advanced topics in risk and reliability analysis: Model uncertainty: Its characterization and quantification, 20:874 (R;US)

RIVERS
See also COLUMBIA RIVER
50th report of the Arbeitsgemeinschaft Rhein-Wasserwerke. Annual report 1993, 20:1855 (R;DE;In German)
Results of the physical-chemical investigations 1992; in tables, 20:1854 (I;DE;In German)

RIVETS
See FASTENERS

ROBOTS
Advanced robotic technologies for transfer at Sandia National Laboratories, 20:1448 (R;US)
Automatic generation of fuzzy rules for the sensor-based navigation of a mobile robot, 20:1038 (R;US)
Robotic Manufacturing Science and Engineering Laboratory (RMSEL), 20:1041 (R;US)
Unknown-terrains navigation of a mobile robot using an array of sonars, 20:1432 (R;US)

ROCK BURSTS
Improvement of working conditions in black coal mines by prevention of gas eruptions and by protection of miners in case of gas eruptions: Final report, 20:76 (R;DE;In German)

ROCKETS
Missile sizing for ascent-phase intercept, 20:1699 (R;US)

ROCKGAS PROCESS
See COAL GASIFICATION

ROCKS
See also METAMORPHIC ROCKS
Test interference calculations for the Yucca Mountain Project ESF thermomechanical experiments: Yucca Mountain Site Characterization Project, 20:314 (R;US)

ROCKY FLATS PLANT
A research study to determine the effect of Total Quality Management (TQM) on employee morale in Plant Procedures Division at EG&G, Rocky Flats, Inc., 20:911 (R;US)
Preliminary surficial geologic map of the Rocky Flats Plant and vicinity, Jefferson and Boulder Counties, Colorado, 20:1840 (R;US)

ROCKY MOUNTAIN REGION
See USA

ROCKY MOUNTAINS
Large eddy simultations of the atmospheric boundary layer east of the Colorado Rockies, 20:1764 (R;US)

RODS (CONTROL)
See CONTROL ELEMENTS

RODS (FUEL)
See FUEL RODS
ROENTGEN (EXPOSURE UNIT)
See RADIATION DOSE UNITS
ROENTGEN EQUIVALENT MAN
See RADIATION DOSE UNITS
ROMANIA
Training and qualification of NPP personnel in Romania, 20:2504 (RA;XA)
ROMBACH PROCESS
See COAL GASIFICATION
ROMEO EVENT
See NUCLEAR EXPLOSIONS
ROOFS
Load test of the 272E Building high bay roof deck and support structure, 20:523 (R;US)
Load test of the 3701D Building roof deck and support structure, 20:524 (R;US)
Load test of the 3790 Building Roof Deck and Support Structure, 20:525 (R;US)
Proceedings of the Low-Slope Reroofing Workshop: A review of the alternatives, 20:1430 (R;US)
[Low-slope re-roofing workshop keynote], 20:1431 (R;US)
ROSSENDORF ZFK
See ZFK ROSSENDORF
RUBBER (NATURAL)
See NATURAL RUBBER
RUBBERS
See also LATEX
NATURAL RUBBER
A study of using polythiol compounds and 2-ethyl-hexyl-acrylate with carbon tetrachloride as sensitizers for radiation vulcanization of natural rubber latex, 20:1379 (I;TH;In Thai)
RUBIDIUM ISOTOPES
Mass measurements of short-lived isotopes in traps and storage rings, 20:1630 (R;DE)
RULISON EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS
RUMANIA
See ROMANIA
RUNOFF
Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique, 20:295 (R;US)
RUPTURE DISKS
See RELIEF VALVES
RUSSIAN FEDERATION
Information on the projects of technical assistance in personnel training for Russian NPPS. Presentation of Russia, 20:2506 (RA;XA)
Russian programme and experience on nuclear power plant personnel training system development, 20:2481 (RA;XA)
RUTHENIUM
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
RUTHENIUM COMPLEXES
Excited state processes in transition metal complexes. Redox splitting in soluble polymers: Progress report, July 15, 1993–July 14, 1994, 20:1374 (R;US)

S

S CODES
SASSI system software configuration, 20:1454 (R;US)
SACCHARIDES
See also OLIGOSACCHARIDES
A process for separating acid-sugar mixtures using ion exclusion chromatography, 20:627 (R;US)
SACCHAROMYCES CEREVISIAE
Transformation-associated recombination between diverged and homologous DNA repeats is induced by strand breaks, 20:1866 (R;US)
SACLAY LINAC
Dimensions resulting from $\delta\Phi_s.\delta(\Delta E)_L$ defects, 20:1518 (R;FR;In French)
Final energy dependence on phase fluctuations $\delta\Phi_s$ and on the level of $(\Delta E)_L$, 20:1519 (R;FR;In French)
SAFEGUARDS
See also IAEA SAFEGUARDS
Safeguards and Security Research and Development progress report, October 1992–September 1993, 20:557 (R;US)
SAFETY (NUCLEAR)
See RADIATION PROTECTION
SAFETY (REACTOR)
See REACTOR SAFETY
SAFETY STANDARDS
Contrasts between risk-based and prescriptive environmental restoration standards and their relative effectiveness, 20:912 (RA;US)
SAFETY VALVES
See RELIEF VALVES
SAINT LAURENT-2 REACTOR
Activation calculations for dismantling - The feedback of a 7 years experience in activation calculations for graphite gas cooled reactors in France, 20:769 (R;FR)
SALINE ZONE
See OIL SHALES
PICEANCE CREEK BASIN
SALMON
Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)
SALT TRANSPORT PROCESS
See PYROCHEMICAL REPROCESSING
SALTS
A visual cell for measuring the solubility of prograde soluble salts in water at high temperatures and pressures, 20:1367 (R;US)
SAMARIUM ALLOYS
A shock-Hugoniot for $Sm_2 Fe_{17} N_x$ powder, 20:1179 (IA;AU)
High coercive $Sm_2Fe_{17}N_x$ powders prepared by HDDR, 20:1121 (IA;AU)
Magnetic properties of nano-materials of $Sm_3 (Fe_{1-x} Ti_x)_{29}$ $(0.04 \leq x \leq 0.06)$, 20:1132 (IA;AU)
Magnetic properties of novel ternary phase: $Sm_3 (Fe_{1-x} Ti_x)_{29}$ $(0.04 \leq x \leq 0.06)$, 20:1131 (IA;AU)
SAMARIUM BORIDES
Magnetic field dependence of the correlation gap in SmB_6, 20:1232 (R;US)
SAMPLERS
See also AIR SAMPLERS
200 Area weekly report, 20:172 (R;US)
BCE selector valves and flow proportional sampler, 20:1658 (R;US)
SANDIA LABORATORIES
A Sandia National Laboratories decontamination and demolition success story, 20:514 (R;US)
An overview: Component development for solar thermal systems, 20:708 (R;US)
Historical sketches of Sandia National Laboratories nuclear field testing: Volume 1: Full discussion except for sensitive references, 20:1695 (R;US)
Neutron Generator/Switch Tube (NG/ST) prototyping relocation environmental assessment, 20:450 (R;US)
Partnering with Sandia National Laboratories through alliances or consortia, 20:936 (R;US)
Recent reflux receiver developments under the US DOE program, 20:707 (R;US)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)
Robotic Manufacturing Science and Engineering Laboratory (RMSEL), 20:1041 (R;US)

US House of Representatives Committee on Energy and Commerce Subcommittee on Energy and Power, 20:934 (R;US)
Using Process Quality Management Improvement (PQMI) to develop business processes and procedures, 20:935 (R;US)
Zinc/air technology, December 1993 meeting report, 20:900 (R;US)

SANITARY LANDFILLS
Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring, 20:289 (R;US)
Preliminary assessment of numerical data requirements TA-73 landfill Los Alamos, New Mexico, 20:459 (R;US)

SATELLITES
Thermal design of the fast-on-orbit recording of transient events (FORTE) satellite, 20:1696 (R;US)

SAVANNAH RIVER PLANT
Baseline Ecology
Preliminary site characterization - final report, 20:442 (R;US)
Engineering
Preliminary engineering studies, Savannah River Plant, quarterly report July 1954, 20:154 (R;US)
Environmental Effects
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: First quarter, 1994, 20:475 (R;US)
Environmental Policy
Treatment of M-area mixed wastes at the Savannah River Site, 20:230 (R;US)
Fission Products
[Dispersion of fission products], 20:742 (R;US)
Historical Aspects
Minutes of Technical Division steering committee meeting August 11, 1953, Wilmington, 20:841 (R;US)
Personnel requirements, 20:942 (R;US)
Hydrology
Hydrologic budget for A/M Area, Savannah River Site, 20:477 (R;US)
Operation
200 Area weekly report, 20:169 (R;US)
200 Area weekly report, 20:178 (R;US)
200 Area weekly report, 20:171 (R;US)
200 Area weekly report, 20:180 (R;US)
200 Area weekly report, 20:170 (R;US)
200 Area weekly report, 20:182 (R;US)
200 Area weekly report, 20:168 (R;US)
200 Area weekly report, 20:165 (R;US)
200 Area weekly report, 20:175 (R;US)
200 Area weekly report, 20:176 (R;US)
200 Area weekly report, 20:174 (R;US)
200 Area weekly report, 20:172 (R;US)
200 Area weekly report, 20:184 (R;US)
200 Area weekly report, 20:177 (R;US)
200 Area weekly report, 20:166 (R;US)
200 Area weekly report, 20:183 (R;US)
200 Area weekly report, 20:173 (R;US)
200 Area weekly report, 20:167 (R;US)
Decommissioning of facilities at the Savannah River Site, 20:540 (R;US)
Minutes of Technical Division Steering Committee Meeting December 13, 1955, Savannah River Laboratory, 20:254 (R;US)
Personnel
Personnel requirements, 20:942 (R;US)
Radiation Monitoring
Savannah River Site Environmental Monitoring Plan: Volume 1, Section 1000 Addendum: Revision 3, 20:473 (R;US)
Radioactive Effluents
Project 8980, Savannah River Plant, 200 Area: Water handling system, segregation of process water, 20:836 (R;US)
Radioactive Waste Disposal
Mercury in shallow Savannah River Plant soil, 20:253 (R;US)
Radioactive Waste Management
Tritium pumps which once contained mercury meet the RCRA definition of "empty container", 20:430 (R;US)
Vegetation concentration and inventory of metals and radionuclides in the old F-area seepage basin, 904-49G, 20:543 (R;US)
Radioactive Waste Storage
200 Area weekly report, 20:181 (R;US)
Characterization of uranium, plutonium, neptunium, and americium in HLW supernate for LLW certification, 20:436 (R;US)
High level waste characterization in support of low level waste certification: I. HLW supernate radionuclide characterization, 20:435 (R;US)
Remedial Action
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
Reprocessing
200 Area weekly report, 20:182 (R;US)
200 Area weekly report, 20:177 (R;US)
200 Area weekly report, 20:173 (R;US)
200 Area weekly report, 20:176 (R;US)
200 Area weekly report, 20:171 (R;US)
200 Area weekly report, 20:183 (R;US)
200 Area weekly report, 20:170 (R;US)
200 Area weekly report, 20:184 (R;US)
200 Area weekly report, 20:174 (R;US)
200 Area weekly report, 20:179 (R;US)
200 Area weekly report, 20:181 (R;US)
200 Area weekly report, 20:167 (R;US)
200 Area weekly report, 20:169 (R;US)
200 Area weekly report, 20:168 (R;US)
200 Area weekly report, 20:180 (R;US)
200 Area weekly report, 20:178 (R;US)
200 Area weekly report, 20:172 (R;US)
200 Area weekly report, 20:166 (R;US)
200 Area weekly report, 20:165 (R;US)
200 Area weekly report, 20:175 (R;US)
Site Characterization
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
Preliminary site characterization - final report, 20:442 (R;US)
Special Production Reactors
Incidents that require emergency operating procedures, 20:872 (R;US)
Travel to Battelle Memorial Institute: Trip report, September 17, 24, and October 8, 1953, 20:152 (R;US)
[Discussion by R. M. Evans at a meeting held with the members of the Military Liaison Committee on February 17, 1954], 20:843 (R;US)
Waste Management
Environmental assessment for the transportation and disposal of Savannah River Site generated municipal solid waste at an off-site disposal facility, 20:231 (R;US)
H-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:441 (R;US)
H-Area, K-Area, and Par Pond Sewage Sludge Application Sites groundwater monitoring report: Second quarter 1994, 20:439 (R;US)
H-area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:432 (R;US)
M-Area Hazardous Waste Management Facility Groundwater Monitoring Report-Fourth Quarter 1993 and 1993 Summary, 20:542 (R;US)
M-Area Hazardous Waste Management Facility groundwater monitoring report - fourth quarter 1993 and 1993 summary, 20:541 (R;US)
P-Area Acid/Caustic Basin groundwater monitoring report: First quarter 1994, 20:434 (R;US)
Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)

Water Pollution
M-Area Hazardous Waste Management Facility groundwater monitoring report – Fourth quarter 1993 and 1993 summary: Volume 2, 20:474 (R;US)
Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report: Second quarter 1994, 20:476 (R;US)
Water Quality
H-Area, K-Area, and Par Pond Sewage Sludge Application Sites groundwater monitoring report: Second quarter 1994, 20:439 (R;US)
K-Area acid/caustic basin groundwater monitoring report: First quarter 1994, 20:433 (R;US)
The Savannah River Site's groundwater monitoring program: First quarter 1994, 20:458 (R;US)

SAVANNAH RIVER PLANT C REACTOR
See C REACTOR

SCANDINAVIA
See also DENMARK
FINLAND
SWEDEN
Tectonic regimes in the Baltic Shield during the last 1200 Ma - A review, 20:1837 (R;SE)

SCANDIUM COMPLEXES
Monte Carlo simulation of nanodomain textures in relaxor-type lead scandium tantalate, 20:2352 (IA;AU)

SCANDIUM IONS
Covalency of scandium(III) as manifested in the enthalpies of solution of anhydrous rare earth halides, 20:1359 (IA;PL)

SCANDIUM SULFATES
Determination of hydrate numbers from solubility data, 20:1358 (IA;PL)

SCATTERING
See also ELASTIC SCATTERING
Relativistic quantum mechanics in a periodic potential, 20:1991 (IA;AU)

SCHMALFELDT-WINTERSHALL PROCESS
See COAL GASIFICATION

SCHOOL FACILITIES
See EDUCATIONAL FACILITIES

SCHOOL PLANT
See EDUCATIONAL FACILITIES

SCHOOLS
See EDUCATIONAL FACILITIES

SCHOTTKY BARRIER DIODES
New feature in the magnetoresistance of silicon, 20:1269 (IA;AU)

SCHROEDINGER EQUATION
Strong phase correlations of solitons of nonlinear Schroedinger equation, 20:1983 (R;XA)

SCHWINGER-TOMONAGA FORMALISM
Topological zero modes in Monte Carlo simulations, 20:2078 (R;DE)

SCIENTIFIC PERSONNEL
Training of nuclear power plant personnel in Canada, 20:2497 (RA;XA)

SCOTCH EVENT
See NUCLEAR EXPLOSIONS
UNDERGROUND EXPLOSIONS

SCOTLAND
See UNITED KINGDOM

SCREWS
See FASTENERS

SEABOARD PROCESS
See DESULFURIZATION

SEALED SOURCES
INEL storage facility for sealed sources from the commercial sector, 20:452 (R;US)

SEALING MATERIALS
Radioisotope Thermoelectric Generator Package O-Ring Seal Material Validation Testing, 20:1005 (R;US)

SEAS
See also ATLANTIC OCEAN
PACIFIC OCEAN
Model-based inversion for a shallow ocean application, 20:1974 (R;US)

SEASONAL THERMAL ENERGY STORAGE
Possibility of introducing heat storage technologies to Hokkaido, 20:894 (R;JP;In Japanese)

SEASONINGS
See FOOD

SEBACEOUS GLANDS
See SKIN

SECONDARY BATTERIES
See ELECTRIC BATTERIES

SECONDARY RECOVERY
See ENHANCED RECOVERY

SECURITY
Safeguards and Security Research and Development progress report, October 1992–September 1993, 20:557 (R;US)
Security Transition Program Office; progress report, 20:548 (R;US)

SEDIMENT BASINS
See SETTLING PONDS

SEDIMENTARY BASINS
Calibration of simulated temperature histories of sedimentary basins, 20:104 (R;DE;In German)

SEDIMENTS
Comparison of methods for developing contaminant-particle size distributions for suspended sediment, 20:227 (R;US)

SEISMIC ARRAYS
Computer programs for analysis of geophysical data, 20:1973 (R;US)

SEISMIC NOISE
Computer programs for analysis of geophysical data, 20:1973 (R;US)

SELENIUM
Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)

SELENIUM COMPLEXES
Selenophene transition metal complexes, 20:1364 (R;US)

SELENIUM COMPOUNDS
Dynamic NMR studies of restricted arene rotation in the chromiu tricarbonyl thiophene and selenophene complexes, 20:1363 (R;US)

SELF-POWERED NEUTRON DETECTORS
Dynamic compensation of the silver self-powered neutron detector in the ramp program at Osiris reactor, 20:824 (R;FR)

SELLAFIELD REPROCESSING PLANT
BNFL Sellafield further public consultation: Summary of responses, 20:185 (I;GB)

SELOX PROCESS
See COAL GASIFICATION

SEMICONDUCTOR COUNTERS
See SEMICONDUCTOR DETECTORS

SEMICONDUCTOR DETECTORS
See also SI SEMICONDUCTOR DETECTORS
SURFACE BARRIER DETECTORS
Semiconductor detectors in nuclear and particle physics, 20:1617 (R;US)

SEMICONDUCTOR DEVICES
See also CHARGE-COUPLED DEVICES
SEMICONDUCTOR DIODES
Application of quaternary phase diagrams to compound semiconductor processing, 20:1244 (R;US)
Final report for design and development SAWAFE peak detector chip, 20:1502 (R;US)
Plastic encapsulated parts, 20:1501 (R;US)
Spectroscopic, morphological, and electrical characterization of PdGe ohmic contacts to n-GaAs, 20:1507 (R;US)

SEMICONDUCTOR DIODES
See also SCHOTTKY BARRIER DIODES
SILICON DIODES
Lifetime and bistability in electron tunneling in a double barrier structure, 20:2394 (IA;AU)

SEMICONDUCTOR JUNCTIONS
See also HETEROJUNCTIONS

Photoionization of shallow donor impurities in finite-barrier quantum wells, 20:2283 (R;XA)
Ultrafast optical studies of surface reaction processes at semiconductor interfaces: Progress report, 20:682 (R;US)

SEMICONDUCTOR MATERIALS
Analysis of compound semiconductor materials using heavy ion recoil spectrometry, 20:2330 (IA;AU)
Application of quaternary phase diagrams to compound semiconductor processing, 20:1244 (R;US)
Cleavage luminescence in semiconductors, 20:1189 (IA;AU)
Defect production and recombination during low-energy ion processing, 20:1286 (R;US)
Lattice relaxation in stained layer semiconductors studied by in situ X-ray topography during MBE growth, 20:2324 (IA;AU)
Optical instabilities and chaos due to the virtual formation of biexcitons, 20:2301 (R;XA)
Plastic encapsulated parts, 20:1501 (R;US)
Reciprocal space mapping of epitaxial materials using position-sensitive x-ray detection, 20:1673 (R;US)
Scanning deep level transient spectroscopy using an MeV ion microprobe, 20:2327 (IA;AU)
The influence of ion, electron and photon irradiation on the level of hydrogen at the interface of metal-semiconductor systems, 20:1277 (IA;AU)
Translational-energy-resolved studies of photographed carrier-induced reactions on semiconductor surfaces: Electron transfer reactions at semiconductor surfaces: Dynamical studies, 20:1375 (R;US)
X-ray studies of microstructures in semiconductor and superconducting materials: Progress report, 20:1245 (R;US)

SEPARATION PROCESSES
See also CHEMISORPTION
FLOTATION
ISOTOPE SEPARATION
Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:1787 (R;US)

SERIES EXPANSION
Staggered magnetization in the Heisenberg antiferromagnet, 20:2074 (R;AU)

SERUM (BLOOD)
See BLOOD SERUM

SERVICE SECTOR
ELSE - a model for forecasting electricity demand in the service sector: En prognosemodel for servicesektorens elforbrug, 20:995 (R;DK;In Danish)

SETTLING PONDS
Critically safety evaluation for K Basins sandfilters, 20:344 (R;US)
K-West and K-East basin thermal analyses for dry conditions, 20:346 (R;US)
Test procedure forms for sludge retrieval and packaging, 20:349 (R;US)

SEWAGE
Project L-070, "300 Area process sewer piping system upgrade" Project Management Plan, 20:1771 (R;US)

SHATTERING
See FRAGMENTATION

SHEATHS (FUEL)
See FUEL CANS

SHELLS (CONTAINMENT)
See CONTAINMENT SHELLS

SHIELDING
Radiation shielding calculation for the MOX fuel fabrication plant Melox, 20:814 (R;FR)

SHOCK (IMPACT)
See IMPACT SHOCK

SHOCK WAVES
A Shock-Hugoniot for $YBa_2 Cu_3 O_7$ powder, 20:1184 (IA;AU)

SHOWER COUNTERS
Precision determination of the Z^o resonance parameters, 20:1655 (R;NO)
The D0 Level 1.5 Calorimeter Trigger, 20:1624 (R;US)

SHUTDOWN (REACTOR)
See REACTOR SHUTDOWN

SI SEMICONDUCTOR DETECTORS
Design and implementation of an integrated architecture for massive parallel data treatment of analogue signals supplied by silicon detectors of very high spatial resolution, 20:2539 (R;FR;In French)
Enhancements in the Livermore spectrum analysis package PIXEF, 20:2341 (R;US)
Influence of oxidation on radiation hardness of silicon detectors, 20:1616 (R;US)
Mechanical design of the D0 silicon detector, 20:1626 (R;US)

SIALON
See ALUMINIUM OXIDES
SILICON NITRIDES

SIGMA MODEL
On validity of perturbative quantization of the breathing mode in the Skyrme model, 20:2054 (R;UA)

SIGMA-410 RESONANCES
See SIGMA MODEL

SILANES
Plasma-indued separation of amorphous siliced separation of amorphous silicon from silane: From the understanding of the hemichemical reation mection mechanism to separation of valuable amorphous silion with great rates of deposition, 20:1115 (I;DE;In German)
Scale-up and modeling of forced chemical vapor infiltration, 20:725 (R;US)

SILICA
Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)

SILICATES
Modular coupling of transport and chemistry: theory and model applications, 20:1833 (R;CH)

SILICIC ACID ESTERS
See ORGANIC SILICON COMPOUNDS

SILICON
Amorphous State
Plasma-indued separation of amorphous siliced separation of amorphous silicon from silane: From the understanding of the hemichemical reation mection mechanism to separation of valuable amorphous silion with great rates of deposition, 20:1115 (I;DE;In German)
Chemical Vapor Deposition
Large-area triple-junction a-Si alloy production scaleup: Annual subcontract report, 17 March 1993–18 March 1994, 20:686 (R;US)
Defects
Defects in multicrystalline silicon for solar cells: Defect behavior under heat treatment: Final report, 20:1114 (I;DE;In German)
Deposition
Plasma-indued separation of amorphous siliced separation of amorphous silicon from silane: From the understanding of the hemichemical reation mection mechanism to separation of valuable amorphous silion with great rates of deposition, 20:1115 (I;DE;In German)
Electric Conductivity
Conductivity in insulators due to implantation of conducting species, 20:2360 (R;AU)
Electric Potential
Current-voltage characteristics of porous silicon, 20:1271 (IA;AU)
Heat Treatments
Defects in multicrystalline silicon for solar cells: Defect behavior under heat treatment: Final report, 20:1114 (I;DE;In German)
Heterojunctions
Heterojunctions of Cd Se and amorphous silicon, 20:1272 (IA;AU)
Indium Additions
Zeeman spectroscopy of indium acceptor impurity in silicon, 20:1264 (IA;AU)
Ion Implantation
Conductivity in insulators due to implantation of conducting species, 20:2360 (R;AU)
Photoluminescence
Visible photoluminescence from hydrogenated silicon particles suspended in a silane plasma, 20:2418 (R;CH)

Physical Properties
Theoretical study of the noble metals on semiconductor surfaces and Ti-base shape memory alloys, 20:1146 (R;US)

Porous Materials
Current-voltage characteristics of porous silicon, 20:1271 (IA;AU)
Porous silicon studies by soft X-ray emission spectroscopy, 20:2323 (IA;AU)

Schottky Barrier Diodes
Memory switching and quantum effects in amorphous hydrogenated silicon, 20:2353 (IA;AU)

Surface Properties
Theoretical study of the noble metals on semiconductor surfaces and Ti-base shape memory alloys, 20:1146 (R;US)

Surface Treatments
Ab initio Hartree-Fock study of the B/Si(001) 2 x 1 adsorption system, 20:1349 (IA;AU)

Switches
Memory switching and quantum effects in amorphous hydrogenated silicon, 20:2353 (IA;AU)

Topology
Ab initio Hartree-Fock study of the B/Si(001) 2 x 1 adsorption system, 20:1349 (IA;AU)

Zeeman Effect
Zeeman spectroscopy of indium acceptor impurity in silicon, 20:1264 (IA;AU)

SILICON 32
Production of high specific activity silicon-32, 20:1419 (PA;US)

SILICON ALLOYS
Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Structural and magnetic properties of Nd $Ni_{8.6-x}$ Fe_x $Si_{2.4}$, 20:1138 (IA;AU)
Toughened Silcomp composites for gas turbine engine applications: Continuous fiber ceramic composites program: Phase I final report, April 1992–June 1994, 20:1063 (R;US)

SILICON CARBIDES
Creep behavior in SiC whisker-reinforced alumina composite, 20:1240 (R;US)
Fatigue and component-tests on SiSiC-tubes, 20:1236 (R;DE;In German)
High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994, 20:1177 (R;US)
Toughened Silcomp composites for gas turbine engine applications: Continuous fiber ceramic composites program: Phase I final report, April 1992–June 1994, 20:1063 (R;US)

SILICON COMPOUNDS
See also SILANES
SILICATES
SILICON CARBIDES
SILICON NITRIDES
SILICON OXIDES
Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants, 20:317 (R;US)

SILICON DIODES
Electrically detected magnetic resonance from a silicon p-n junction diode, 20:2326 (IA;AU)
New feature in the magnetoresistance of silicon, 20:1269 (IA;AU)

SILICON HYDRIDES
See SILANES

SILICON NITRIDES
A study of mechanical processing damage in brittle materials: Annual progress report, April 1, 1990–March 31, 1991, 20:1175 (R;US)
High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994, 20:1177 (R;US)
Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics, 20:1172 (R;US)
The formation of reaction bonded Si_3N_4 at low temperatures and in short times, 20:1171 (R;US)
The nitridation of high purity, laser-synthesized silicon powder to form reaction bonded silicon nitride, 20:1170 (R;US)

SILICON OXIDES
See also SILICA
Carbon dioxide, hydrographic, and chemical data obtained during the R/V Meteor Cruise 11/5 in the South Atlantic and Northern Weddell Sea areas (WOCE sections A-12 and A-21), 20:1857 (R;US)

SILICON SEMICONDUCTOR DETECTORS
See SI SEMICONDUCTOR DETECTORS

SILICON SOLAR CELLS
Development of concentrator solar cells, 20:691 (R;US)
Fabrication and characterization of contact layers in amorphous silicon solar cells, 20:1281 (R;DE;In German)
Large-area triple-junction a-Si alloy production scaleup: Annual subcontract report, 17 March 1993–18 March 1994, 20:686 (R;US)
Research on stable, high-efficiency amorphous silicon multijunction modules: Final subcontract report, 1 January 1991–31 August 1994, 20:685 (R;US)
Silicon-Film™ photovoltaic manufacturing technology: Semiannual subcontract report, 15 October 1993–15 April 1994, 20:684 (R;US)

SILICONES
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)

SILVER
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
Manipulation of growth mode in the homoepitaxy illustrated by an example of Ag(111), 20:1148 (R;DE;In German)
Recovery and recycling of aluminum, copper, and precious metals from dismantled weapon components, 20:318 (R;US)
Thermal processes at compacted composite Y Ba_2 Cu_3 O_δ/Ag cooling by liquid nitrogen., 20:1231 (IA;UA;In Russian)

SILVER 109
Radiation - induced silver agglomeration in A zeolites, 20:1382 (IA;PL)

SILVER NITRATES
Adsorption of silver ion on activated carbon via radiochemical method, 20:1306 (IA;TH;In Thai)

SILVER OXIDES
About influence of silver additions on superconducting properties of the HTSC ceramic, 20:1226 (IA;UA;In Russian)

SIMPLEX PROCESS
See COAL GASIFICATION

SIMS
See MASS SPECTROSCOPY

SIMULATORS (REACTOR)
See REACTOR SIMULATORS

SINGLE-PARTICLE MODES
Statistical and direct decay of high-lying single-particle excitations, 20:2210 (R;FR)

SITE CHARACTERIZATION
Forest damage and incremental growth, 20:1955 (IA;DE;In German)
Yucca Mountain Site Characterization Project: Technical Data Catalog (quarterly supplement), June 30, 1994, 20:248 (R;US)

SITE PREPARATION
Idaho National Engineering Laboratory site development plan, 20:1782 (R;US)

SITE REHABILITATION
See REMEDIAL ACTION

SITE SURVEYS
See SITE CHARACTERIZATION

SKIN
Technical basis for beta skin dose calculations at the Y-12 Plant, 20:1947 (R;US)

SL GROUPS
Generalized NLS hierarchies from rational W algebras, 20:2064 (R;FR)

SLC DETECTORS
See STANFORD LINEAR COLLIDER DETECTOR

SLOVAK REPUBLIC
See SLOVAKIA
SLOVAKIA
Spent fuel management in the Slovak Republic, 20:203 (RA;XA)
System of NPP personnel training in Slovak Republic, 20:2508 (RA;XA)
SLUDGES
105KE and 105KW Basins fuel and sludge consolidation study, summary report, 20:347 (R;US)
95-1 Campaign evaporator boildown results, 20:382 (R;US)
Enhanced sludge washing evaluation plan, 20:328 (R;US)
Ferrocyanide safety program: An assessment of the possibility of ferrocyanide sludge dryout, 20:329 (R;US)
Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)
Sludge Stabilization Campaign blend plan, 20:338 (R;US)
Test procedure forms for sludge retrieval and packaging, 20:349 (R;US)
SLUGS (FUEL)
See FUEL RODS
SLURRIES
See also FUEL SLURRIES
1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan, 20:297 (R;US)
A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994, 20:78 (R;US)
Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics, 20:1172 (R;US)
SLURRIES (FUEL)
See FUEL SLURRIES
SMELTERS
Selection of melter systems for the DOE/Industrial Center for Waste Vitrification Research, 20:431 (R;US)
SMOKY EVENT
See NUCLEAR EXPLOSIONS
SN METHOD
See DISCRETE ORDINATE METHOD
SNAKE RIVER PLAIN
Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91, 20:451 (R;US)
Concentrations of tritium and strontium-90 in water from selected wells at the Idaho National Engineering Laboratory after purging one, two, and three borehole volumes, 20:1849 (R;US)
Radionuclides, inorganic constitutents, organic compounds, and bacteria in water from selected wells and springs from the southern boundary of the Idaho National Engineering Laboratory to the Hagerman Area, Idaho, 1992, 20:1785 (R;US)
Stable isotopes of hydrogen and oxygen in surface water and ground water at selected sites on or near the Idaho National Engineering Laboratory, Idaho, 20:1783 (R;US)
Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL, 20:493 (R;US)
SNPA-DEA PROCESS
See DESULFURIZATION
SO-10 GROUPS
Ten dimensional SO(10) G.U.T. models with dynamical symmetry breaking, 20:2066 (R;AU)
SODIUM 20
Beta-decay of ^{20}Mg, 20:2227 (R;DE)
SODIUM 21
Laser trapping of ^{21}Na atoms, 20:2007 (R;US)
SODIUM NITRATES
Clean Salt integrated flowsheet, 20:384 (R;US)
Significant volume reduction of tank waste by selective crystallization: 1994 Annual report, 20:416 (R;US)
SODIUM PHOSPHATES
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)
SOFC
See SOLID ELECTROLYTE FUEL CELLS
SOFT SOLDERING
See SOLDERING
SOIL-STRUCTURE INTERACTIONS
SASSI system software configuration, 20:1454 (R;US)
SOILING
See SURFACE CONTAMINATION
SOILS
Acid Neutralizing Capacity
Soil acidification: its extent, development during the last decades, and causes, 20:1820 (IA;DE;In German)
Acidification
Effect of soil acidification on root growth, nutrient and water uptake, 20:1957 (IA;DE)
Soil acidification: its extent, development during the last decades, and causes, 20:1820 (IA;DE;In German)
Chemical Analysis
Liquid chromatographic method for determination of water in soils and the optimization of anion separations by capillary zone electrophoresis, 20:1329 (R;US)
Contamination
Descriptions of representative contaminated sites and facilities within the DOE complex, 20:511 (R;US)
Mercury in shallow Savannah River Plant soil, 20:253 (R;US)
Site environmental report: 1993, 20:501 (R;US)
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)
The potential of PCB photochemistry at Moccasin Bend, 20:1777 (R;US)
Decontamination
A Sandia National Laboratories decontamination and demolition success story, 20:514 (R;US)
Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)
Magnetic separation for environmental remediation, 20:503 (R;US)
Results of the radiological and beryllium verification survey at the Sacandaga Site, Glenville, New York (SY002V), 20:504 (R;US)
Environmental Effects
The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)
Hydraulic Conductivity
A simulation study of infiltration into surficial sediments at the Subsurface Disposal Area, Idaho National Engineering Laboratory, 20:259 (R;US)
Hydrostratigraphy and recharge distributions from direct measurements of hydraulic conductivity using the UFA™ method, 20:509 (R;US)
Subsurface stormflow modeling with sensitivity analysis using a Latin-hypercube sampling technique, 20:295 (R;US)
Ion Exchange
ALBIOS: an analysis of aluminium biogeochemistry in forested watersheds of North America and Northern Europe, 20:1951 (IA;DE)
Land Pollution
Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)
Leaching
Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:1787 (R;US)
Moisture
The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)
Monitoring
Remedial investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendixes, 20:495 (R;US)

Radiation Scattering Analysis
Electromagnetic scattering from buried objects, 20:1685 (R;US)

Radiochemical Analysis
Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0, 20:218 (R;US)

Radionuclide Migration
Benchmarking of computer codes and approaches for modeling exposure scenarios, 20:239 (R;US)

Remedial Action
Accelerated clean-up at the Hanford Site, 20:520 (R;US)
Oak Ridge background soils project provides data for remedial action evaluation, 20:224 (R;US)
Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:1787 (R;US)
Sour gas plant subsurface remediation technology research and demonstration project: Quarterly technical progress report, January 1, 1994–March 31, 1994, 20:139 (R;US)
Uranium removal from soils: An overview from the Uranium in Soils Integrated Demonstration program, 20:223 (R;US)
Work plan for the treatability study for PCB dehalogenation by Agent 313 in Waste Area Grouping 11 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:1790 (R;US)

Sampling
In situ analysis of soil at an open burning/open detonation disposal facility: J-Field, Aberdeen Proving Ground, Maryland, 20:1773 (R;US)

Soil Conservation
Perennial grass production for biofuels: Soil conversion considerations, 20:630 (R;US)

Vitrification
Arc melter demonstration baseline test results, 20:268 (R;US)
Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)

Water Influx
A multivariate analysis of intrinsic soil components influencing the mean-weight diameter of water-stable aggregates, 20:1798 (R;XA)
Physico-chemical and mineralogical properties influencing water-stability of aggregates of some Italian surface soils, 20:1797 (R;XA)

SOLAR CELLS
See also CADMIUM TELLURIDE SOLAR CELLS
CONCENTRATOR SOLAR CELLS
COPPER SELENIDE SOLAR CELLS
GALLIUM ARSENIDE SOLAR CELLS
GALLIUM PHOSPHIDE SOLAR CELLS
INDIUM PHOSPHIDE SOLAR CELLS
INDIUM SELENIDE SOLAR CELLS
SILICON SOLAR CELLS
Advanced processing technology for high-efficiency, thin-film $CuInSe_2$ and CdTe solar cells: Annual subcontract report, 1 March 1993–28 February 1994, 20:687 (R;US)
Correct measurements of the efficiency of solar cells as a basis for their comparative techno-economical analysis (SOLCOM I 1994.), 20:662 (IA;IL)

SOLAR CENTRAL RECEIVERS
See CENTRAL RECEIVERS

SOLAR COLLECTORS
Development and testing of an integrated collector-latent heat storage for solar service water heating: Final report, 20:704 (I;DE;In German)
Highlights of recent balance of system research and evaluation, 20:694 (R;US)
Optimal design of large solar fields: Maximum energy output, 20:643 (IA;IL)

SOLAR CONCENTRATORS
See also SOLAR REFLECTORS
Testing of the SAIC facets on the stretched-membrane dish, 20:706 (R;US)

SOLAR COOKERS
Final report - Sundyne Company, 20:696 (R;US)

SOLAR COOKING
Final report - Sundyne Company, 20:696 (R;US)

SOLAR ENERGY
Comparative evaluation of solar power generation options: A user's perspective (SOLCOM I 1994.), 20:667 (IA;IL)
Comparative studies of direct and indirect absorption of concentrated solar flux for chemical storage of solar energy (SOLCOM I 1994.), 20:665 (IA;IL)
Methods of evaluating benefits of solar fuel and power production (SOLCOM I 1994.), 20:676 (IA;IL)
Recent National Solar Thermal Test Facility activities, in partnership with industry, 20:702 (R;US)
Solar concentration/destruction of pesticide rinsewater, 20:695 (R;US)
Solar energy in building renovation: Working documents - Denmark. Feasibility study phase. National participation plan. Solar renovation potential. Case studies. Introduction to solar walls, 20:697 (R;DK)
Solar thermal activities in Australia: An overview (SOLCOM I 1994.), 20:679 (IA;IL)

SOLAR ENERGY CONVERSION
See also SOLAR THERMAL CONVERSION
Thermodynamics of solar power conversion (SOLCOM I 1994.), 20:675 (IA;IL)
Ultrafast optical studies of surface reaction processes at semiconductor interfaces: Progress report, 20:682 (R;US)

SOLAR EQUIPMENT
See also PHOTOVOLTAIC POWER SUPPLIES
SOLAR CELLS
SOLAR COLLECTORS
SOLAR CONCENTRATORS
SOLAR COOKERS
SOLAR HEATING SYSTEMS
*On the second law efficiency of thermal energy storage (SOLCOM I 1994.), 20:649 (IA;IL)

SOLAR HEAT ENGINES
Recent National Solar Thermal Test Facility activities, in partnership with industry, 20:702 (R;US)

SOLAR HEATING SYSTEMS
See also PASSIVE SOLAR HEATING SYSTEMS
Combined heat pump and solar heating system for villas: Phase 1, 20:700 (R;DK;In Danish)
Measurement and evaluation of combined solar heating system for space and water heating at Egebjerggaard 3 (Skotteparken), 20:699 (R;DK;In Danish)

SOLAR INDUSTRY
Benefits of deploying solar systems at large scale and to provide energy in various forms (SOLCOM I 1994.), 20:656 (IA;IL)
Efficiency measures in solar electrical production: A consistent terminology (SOLCOM I 1994.), 20:659 (IA;IL)

SOLAR NEUTRINOS
Boron neutrino flux and the MSW solution of the solar neutrino problem, 20:2149 (R;US)

SOLAR POWER PLANTS
See also PHOTOVOLTAIC POWER PLANTS
SOLAR THERMAL POWER PLANTS
Assessment of performance and economics of parabolic trough solar electric systems for selected Mediterranean countries (SOLCOM I 1994.), 20:669 (IA;IL)
Comparative assessments of solar and conventional power plants (SOLCOM I 1994.), 20:671 (IA;IL)
Evaluation of performance and cost trade-off in the optimization of solar dish electric system (SOLCOM I 1994.), 20:670 (IA;IL)
Field testing programme for solar- and wind energy applications in developing countries (REBRA): Final report, 20:999 (I;DE;In German)
On the optimization of the solar-driven combined cycle (SOLCOM I 1994.), 20:664 (IA;IL)
Photo catalysis and radiation absorption in a solar plant (SOLCOM I 1994.), 20:666 (IA;IL)
Techno-electronic comparison of advanced solar power plant schemes (SOLCOM I 1994.), 20:672 (IA;IL)

Thermal storage for solar dynamic power generation: Performance indicators in a second law perspective (SOLCOM I 1994.), 20:645 (IA;IL)

SOLAR RADIATION
See also DIFFUSE SOLAR RADIATION
Solar Radiation Resource Assessment Project: Program overview of fiscal year 1993, 20:642 (R;US)

SOLAR REFLECTORS
Characterization of mirror reflectivity losses caused by dust deposited under various meteorological conditions (SOLCOM I 1994.), 20:648 (IA;IL)

SOLAR THERMAL CONVERSION
Second law aspects of solar thermal energy conversion (SOLCOM I 1994.), 20:644 (IA;IL)
The U.S. Department of Energy's role in commercialization of solar thermal electric technology, 20:701 (R;US)

SOLAR THERMAL POWER PLANTS
A comparative configuration assessment of a solar thermal plant in the Eilat area (SOLCOM I 1994.), 20:660 (IA;IL)
Comparative assessment of the costs and benefits of solar thermal concentrating technologies for power generation (SOLCOM I 1994.), 20:661 (IA;IL)
Comparative assessment of the technical performance of solar thermal concentrating technologies for power generation (SOLCOM I 1994.), 20:668 (IA;IL)
Comparison of SEGS solar field performance from laboratory and operating plant testing (SOLCOM I 1994.), 20:651 (IA;IL)
Industrial opportunities for solar tower technologies in Israel (SOLCOM I 1994.), 20:652 (IA;IL)
The solar two project: A status and discussion of performance assessment (SOLCOM I 1994.), 20:650 (IA;IL)

SOLDERED JOINTS
Survivability of soldered leadless chip carriers after temperature cycling, 20:1500 (R;US)

SOLDERING
Evaluation of no-clean solder process designed to eliminate the use of ozone-depleting chemicals, 20:1763 (R;US)

SOLID CLUSTERS
Study of small carbon and semiconductor clusters using negative ion threshold photodetachment spectroscopy, 20:2296 (R;US)

SOLID ELECTROLYTE FUEL CELLS
Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly status report, July–September 1993, 20:1009 (R;US)
Monolithic solid oxide fuel cell technology advancement for coal-based power generation: Quarterly technical status report, April–June, 1992, 20:1007 (R;US)
Solid oxide fuel cells in the United States, 20:1012 (R;US)

SOLID SCINTILLATION DETECTORS
See also PLASTIC SCINTILLATION DETECTORS
A high temporal resolution solid state thermal neutron detector, 20:1638 (IA;AU)
Studies on a modular high-energy photon spectrometer of pure CsI scintillators, 20:1644 (R;DE;In German)

SOLID STATE LASERS
Continuously-tunable, narrow-linewidth, Q-switched Cr:LiSAF laser for lidar applications, 20:1765 (R;US)

SOLID WASTES
1994 Solid waste forecast summary: Waste characteristics and treatability groups, 20:327 (R;US)
Environmental assessment for the transportation and disposal of Savannah River Site generated municipal solid waste at an off-site disposal facility, 20:231 (R;US)
NEO-LISP: Deflecting near-earth objects using high average power, repetitively pulsed lasers, 20:1971 (R;US)

SOLIDS
On the effects of gravitational fields on the electrical properties of matter, 20:2006 (R;AU)
Operator's manual for the multistation offgas analysis system, 20:1489 (R;US)
Relativistic quantum mechanics in a periodic potential, 20:1991 (IA;AU)
Separation of solids from coal liquefaction products using sonic waves, 20:49 (R;US)
Strain measurement by diffraction at LANSCE, 20:1330 (R;US)
Time-resolved analytical methods for liquid/solid interfaces: Progress report, November 1, 1993–October 31, 1994, 20:1296 (R;US)

SOLUBILITY
A visual cell for measuring the solubility of prograde soluble salts in water at high temperatures and pressures, 20:1367 (R;US)

SOLUTION MINING
Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)

SOLVENT EXTRACTION
Determination of ^{90}Sr in grass and soil, 20:1335 (R;CH)
Extraction of lanthanides, americium(III) and yttrium by TBP from thiocyanate and azide solutions, 20:1317 (IA;PL)
Liquid-liquid partition and hydration of some bis and tris-β-diketonates, 20:1318 (IA;PL)
Some studies on extractive liquid scintillation counting for Th-234/P-234m, 20:1308 (IA;TH;In Thai)

SOLVENTS
200 Area weekly report, 20:180 (R;US)

SONAR
Model-based ocean acoustic passive localization: Revision 1, 20:1675 (R;US)

SOOT
Aromatics oxidation and soot formation in flames: Progress report, August 15, 1993–June 30, 1994, 20:1420 (R;US)
Measurement of diesel exhaust particulate by using CO2 conversion.: Separating measure for volatile components and total soot by heating collection filter, 20:1071 (IA;JP;In Japanese)

SORBENT INJECTION PROCESSES
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)
LIFAC Sorbent Injection Desulfurization Demonstration Project: Quarterly report number 14, January–March, 1994, 20:67 (R;US)

SOUND NAVIGATION AND RANGING
See SONAR

SOUTH KOREA
See REPUBLIC OF KOREA

SOUTHEAST REGION
See USA

SOUTHWEST REGION
See USA

SOVIET UNION
See USSR

SPACE HVAC SYSTEMS
Technology data characterizing space conditioning in office buildings: Application to end-use forecasting with COMMEND 4.0, 20:1020 (R;US)

SPACE LATTICES
See CRYSTAL LATTICES

SPACE POWER REACTORS
Characteristics of prototype TOPAZ-II fuel, 20:791 (R;US)
Clad vent set cup open end (closure weld zone) wall-thickness study, 20:819 (R;US)
Issues in the flight qualification of a space power reactor, 20:793 (R;US)

SPACE POWER UNIT REACTOR
See SPACE POWER REACTORS

SPACE VEHICLES
See also REENTRY VEHICLES
GPHS-RTGs in support of the Cassini Mission: Semi annual technical progress report, 28 March 1994–25 September 1994, 20:609 (R;US)
Study of integrated circuits in natural space environment, 20:1659 (R;FR;In French)

SPACECRAFT POWER SUPPLIES
GPHS-RTGs in support of the Cassini Mission: Semi annual technical progress report, 28 March 1994–25 September 1994, 20:609 (R;US)

SPAIN
Communications received from certain Member States regarding guidelines for the export of nuclear material, equipment and technology, 20:568 (R;XA;In Arabic, Chinese, English, French)
Spanish national programme and experience on training and qualification for nuclear power plant personnel, 20:2482 (RA;XA)
Tecnatom training program. Presentation of Spain, 20:2509 (RA;XA)

SPARK IGNITION ENGINES
A method of simulating the inflammation phase of spark ignition engines, 20:1065 (I;DE;In German)
Degree of air delivery of the petrol engine in dynamic operation, 20:1064 (I;DE;In German)

SPECIAL PRODUCTION REACTORS
See also C REACTOR

Emergency Plans
Incidents that require emergency operating procedures, 20:872 (R;US)

Fuel Elements
Preliminary engineering studies, Savannah River Plant, quarterly report July 1954, 20:154 (R;US)
Travel to Battelle Memorial Institute: Trip report, September 17, 24, and October 8, 1953, 20:152 (R;US)

Historical Aspects
[Discussion by R. M. Evans at a meeting held with the members of the Military Liaison Committee on February 17, 1954], 20:843 (R;US)

Maintenance
Weekly report - 100 Areas - March 31, 1995, 20:851 (R;US)

Nuclear Fuels
[Discussion by R. M. Evans at a meeting held with the members of the Military Liaison Committee on February 17, 1954], 20:843 (R;US)

Operation
Weekly report - 100 Areas, 20:853 (R;US)
Weekly report - 100 Areas, 20:157 (R;US)
Weekly report - 100 Areas - April 14, 1955, 20:155 (R;US)
Weekly report - 100 Areas - April 28, 1955, 20:156 (R;US)
Weekly report - 100 Areas - April 7, 1955, 20:852 (R;US)
Weekly report - 100 Areas - January 27, 1955, 20:846 (R;US)
Weekly report - 100 Areas - March 10, 1955, 20:848 (R;US)
Weekly report - 100 Areas - March 17, 1955, 20:849 (R;US)
Weekly report - 100 Areas - March 24, 1955, 20:850 (R;US)
Weekly report - 100 Areas - March 3, 1955, 20:847 (R;US)
Weekly report - 100 Areas - March 31, 1995, 20:851 (R;US)

Reactor Accidents
Incidents that require emergency operating procedures, 20:872 (R;US)

Reactor Fueling
Preliminary engineering studies, Savannah River Plant, quarterly report July 1954, 20:154 (R;US)

Thermal Stresses
Weekly report - 100 Areas - March 17, 1955, 20:849 (R;US)

SPECIAL RELATIVITY THEORY
See RELATIVITY THEORY

SPECTROPHOTOMETERS
Spectrophotometric probe, 20:1672 (PA;US)

SPENT FUEL CASKS
200 Area weekly report, 20:176 (R;US)

SPENT FUEL ELEMENTS
Corrosion of spent Advanced Test Reactor fuel, 20:816 (R;US)

SPENT FUEL STORAGE
See also AWAY-FROM-REACTOR STORAGE
DRY STORAGE
MONITORED RETRIEVABLE STORAGE
A review of the technology and experience of spent nuclear fuel storage. Alternatives for the problem of spent fuel in Bulgaria, 20:280 (I;BG)
Comparison of different calculational methods for spent fuel storage criticality calculations, 20:204 (RA;XA)
Groundwater monitoring results for the 100-K Area fuel storage basins: January 1 to March 31, 1994, 20:339 (R;US)
Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994, 20:189 (R;US)
Progress with Scottish Nuclear's proposals for the construction of dry fuel stores at Torness and Hunterston 'B' power stations, 20:205 (RA;XA)
R and D on spent fuel storage in Japan, 20:199 (RA;XA)
Safety features of proposed concepts for spent fuel dry interim storage, 20:194 (RA;XA)
Selection of the type of spent fuel storage at Paks NPP, 20:198 (RA;XA)

SPENT FUELS
105KE and 105KW Basins fuel and sludge consolidation study, summary report, 20:347 (R;US)
Behavior of pre-irradiated fuel under a simulated RIA condition: Results of NSRR test JM-3, 20:817 (R;JP)
CASCAD dry storage concept for spent fuel, 20:196 (RA;XA)
Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)
Experiences in the dry storage of aluminum-clad spent nuclear fuels, 20:210 (R;US)
Extension of Fakir, Kahina, a computer code of kinsfolk actinides heat irradiation neutron and activity, 20:188 (R;FR)
Radionuclide release rates from spent fuel for performance assessment modeling, 20:1856 (R;US)
Waste management plan for Hanford spent nuclear fuel characterization activities, 20:348 (R;US)
Work plan for 105KE Basin seal conveyor relocation, 20:350 (R;US)

SPENT SHALES
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)

SPIN
Single spin asymmetry in inclusive pion production, Collins effect and the string model, 20:2198 (R;FR)

SPIN ECHO
Electron spin-echo studies of spin-spin relaxation processes, 20:1353 (IA;PL)

SPIN-LATTICE RELAXATION
Lattice relaxation in stained layer semiconductors studied by in situ X-ray topography during MBE growth, 20:2324 (IA;AU)

SPIN-OFF
See TECHNOLOGY TRANSFER

SPRINGS (WATER)
See WATER SPRINGS

SPUR REACTOR
See SPACE POWER REACTORS

SQUID DEVICES
Noise in high-T_c r.f. squids, 20:2383 (IA;AU)

SRI LANKA
Current status of nuclear power development, 20:962 (I;LK)

STABILITY (REACTOR)
See REACTOR STABILITY

STACKS
Seismic qualification of ventilation stack, 20:1453 (R;US)

STAINLESS STEEL-18-4-1
See STAINLESS STEELS

STAINLESS STEEL-19-9DL
See STAINLESS STEELS

STAINLESS STEEL-304
A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)
Drum investigation committee final report, 20:212 (R;US)

STAINLESS STEEL-316
A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)
Directed light fabrication, 20:1155 (R;US)

STAINLESS STEEL-316L
A simplified leak-before-break evaluation procedure for austenitic and ferritic steel piping, 20:811 (R;US)

STAINLESS STEEL-Z2CN18-10N
See CHROMIUM-NICKEL STEELS

STAINLESS STEEL-Z3CMN18-8-6N
See CHROMIUM-NICKEL STEELS

STAINLESS STEEL-Z3CND18-13
See CHROMIUM-NICKEL STEELS
STAINLESS STEEL-Z6CND17-13B
See CHROMIUM-NICKEL STEELS
STAINLESS STEEL-Z6CNDT17-13B
See CHROMIUM-NICKEL STEELS
STAINLESS STEEL-Z6CNT18-12B
See CHROMIUM-NICKEL STEELS
STAINLESS STEELS
See also CHROMIUM-NICKEL STEELS
Analysis of welds on helium-containing restraint test plates, 20:813 (R;US)
Copper metallization of stainless steels: Final report, 20:1149 (R;US)
Corrosion evaluation of fuel canister crusher rigging, 20:1165 (R;US)
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)
Static corrosion of construction materials exposed to superphosphoric acid made from various sources of phosphate rock, 20:1104 (R;US)
STANDARD MODEL
Radiative corrections in the MSSM Higgs sector: masses and fermionic decays, 20:2186 (RA;DE)
Radiative corrections to the supersymmetric Higgs sector, 20:2107 (RA;DE)
STANDARDS
See also SAFETY STANDARDS
Department of Energy standards index, 20:2459 (R;US)
Directory of DOE and contractor personnel involved in nongovernment standards activities, 20:2460 (R;US)
STANDING CROP
See BIOMASS
STANFORD LINEAR COLLIDER DETECTOR
Performance of the SLD CCD pixel vertex detector and design of an upgrade, 20:1656 (R;US)
STARCH
A low energy continuous reactor separator for the production of ethanol from corn grits/starch and biomass streams: 2nd Quarterly report, August 1–October 15, 1994, 20:620 (R;US)
STARFISH EVENT
See NUCLEAR EXPLOSIONS
STARS
See also NEUTRON STARS
Properties of strange-matter stars, 20:2025 (R;US)
STATES (ENERGY)
See ENERGY LEVELS
STAUFFER AQUACLAUS PROCESS
See DESULFURIZATION
STEAM INJECTION
Modification of chemical and physical factors in steamflood to increase heavy oil recovery: Annual report, October 1, 1992–September 30, 1993, 20:115 (R;US)
STEAM TURBINES
High-pressure coal-fired ceramic air heater for gas turbine applications: Technical progress report for month of January 1994, 20:83 (R;US)
STEEL-000KH18N13
See CHROMIUM-NICKEL STEELS
STEEL-000KH20N16AG6
See CHROMIUM-NICKEL STEELS
STEEL-000KH25
See STAINLESS STEELS
STEEL-000KH28
See STAINLESS STEELS
STEEL-00KH20N32T
See STAINLESS STEELS
STEEL-03KH11N10M2TK6
See CHROMIUM-NICKEL STEELS
STEEL-03KH13AG13
See STAINLESS STEELS
STEEL-08G2SFB
See CARBON STEELS
STEEL-0KH18G8N2T
See STAINLESS STEELS
STEEL-0KH19NT
See CHROMIUM-NICKEL STEELS
STEEL-12KH2MV8FB
See STEELS
STEEL-12KH2V5FB
See STEELS
STEEL-18KH16N6
See CHROMIUM-NICKEL STEELS
STEEL-18MNV6
See STEELS
STEEL-1KH16N14V2BR EHP17
See CHROMIUM-NICKEL STEELS
STEEL-1KH16N4B
See CHROMIUM-NICKEL STEELS
STEEL-20KH2N2M
See CHROMIUM-NICKEL STEELS
STEEL-20KHN3MF
See CHROMIUM-NICKEL STEELS
STEEL-20M5
See MANGANESE STEELS
STEEL-2KH18N8V2
See CHROMIUM-NICKEL STEELS
STEEL-3KH15N13YU3
See CHROMIUM-NICKEL STEELS
STEEL-4KH12N8G8MFB
See CHROMIUM-NICKEL STEELS
STEEL-4KH14NV2M
See CHROMIUM-NICKEL STEELS
STEEL-ASTM-A533
Effect of neutron irradiation on the impact properties of A533B steel, 20:1162 (R;US)
STEEL-DIN-1-4449
See CHROMIUM-NICKEL STEELS
STEEL-KH14N8YUM2
See CHROMIUM-NICKEL STEELS
STEEL-KH15N7YUM2
See CHROMIUM-NICKEL STEELS
STEEL-KH15N9YU
See CHROMIUM-NICKEL STEELS
STEEL-KH18N8
See CHROMIUM-NICKEL STEELS
STEELS
See also AUSTENITIC STEELS
CARBON STEELS
FERRITIC STEELS
LOW ALLOY STEELS
MANGANESE STEELS
AISI Direct Steelmaking Program: Final technical report, 20:1111 (R;US)
Development of a relational database for rated values of metallic materials: Final report, 20:2570 (I;DE;In German)
Evaluation of mechanical and technological parameters of different material states by nondestructive micro- and macromagnetic measuring quantities as well as ultrasonic techniques (2nd part of the project): Final report, 20:1118 (R;DE;In German)
Heavy-Section Steel Irradiation Program: Volume 2, No. 2: Semiannual progress report, April–September 1991, 20:1160 (R;US)
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)
STELLAR FLARES
Flare stars and Pascal distribution, 20:2013 (R;XA)
STEROIDS
Conversion of free radicals upon annealing of x-irradiated single crystal of cholest-4-en-3-one, 20:1385 (IA;PL)
Radioiodination of testosterone 3-(0-carboxylmethyl) hydroxylamine tyrosine methyl ester, 20:1415 (I;TH;In Thai)

STES
See SEASONAL THERMAL ENERGY STORAGE
STIRLING ENGINES
Solar dish/Stirling technology, a world status report and comparison (SOLCOM I 1994.), 20:678 (IA;IL)
Uniform guidelines for reporting dish/Stirling solar electric system performance to permit comparison (SOLCOM I 1994.), 20:677 (IA;IL)
STONE AND WEBSTER COAL SOLUTION GASIFICATION PROCESS
See COAL GASIFICATION
STONE AND WEBSTER GASIFICATION PROCESS
See COAL GASIFICATION
STORAGE (SPENT FUEL)
See SPENT FUEL STORAGE
STORAGE (WASTES)
See WASTE STORAGE
STORAGE BATTERIES
See ELECTRIC BATTERIES
STORAGE DEVICES (DATA)
See MEMORY DEVICES
STORAGE FACILITIES
Air Samplers
In situ sampling device development engineering task plan, 20:398 (R;US)
Capacity
Spent fuel storage requirements 1993–2040, 20:191 (R;US)
Computerized Control Systems
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
Construction
Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment, 20:449 (R;US)
Data Acquisition Systems
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)
Emergency Plans
Solid Waste Burial Grounds/Central Waste Complex hazards assessment, 20:345 (R;US)
Engineering Drawings
616 Nonradioactive Dangerous Waste Storage Facility – Essential/support drawing list: Revision 2, 20:414 (R;US)
Engineering drawing field verification program: Revision 3, 20:423 (R;US)
Environmental Impacts
Construction of mixed waste storage RCRA facilities, Buildings 7668 and 7669: Environmental assessment, 20:449 (R;US)
Gas Compressors
Acceptance test report for 241-AW process air system, 20:375 (R;US)
Maintenance
Waste sampling and characterization facility (WSCF), 20:427 (R;US)
Manuals
Tank characterization reference guide, 20:418 (R;US)
Measuring Instruments
Software quality assurance plan for void fraction instrument, 20:408 (R;US)
Remedial Action
Clean Salt integrated flowsheet, 20:384 (R;US)
Enhanced sludge washing evaluation plan, 20:328 (R;US)
Feasibility study of tank leakage mitigation using subsurface barriers, 20:529 (R;US)
Hydraulic impact end effector final test report: Automation and robotics section, ER/WM-AT Program, 20:516 (R;US)
Interim data quality objectives for waste pretreatment and vitrification: Revision 1, 20:528 (R;US)
Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility, 20:365 (R;US)
Remote Viewing Equipment
Installation of Remote Monitoring System at the spent fuel storage facility in Lucas Heights, Australia: Foreign trip report, January 26–February 12, 1994, 20:189 (R;US)
Safety Engineering
241-SY-101 air lance removal lessons learned, 20:531 (R;US)
GMS/DACS interface acceptance test report, 20:376 (R;US)
Work plan for transition of SY-101 hydrogen mitigation test project data acquisition and control system (DACS-1), 20:426 (R;US)
Site Selection
INEL storage facility for sealed sources from the commercial sector, 20:452 (R;US)
Viscosimeters
Software quality assurance plan for viscometer, 20:407 (R;US)
Waste Retrieval
1/12-Scale scoping experiments to characterize double-shell tank slurry uniformity: Test plan, 20:297 (R;US)
STORAGE RINGS
See also BROOKHAVEN RHIC
ESR STORAGE RING
HERA STORAGE RING
LEP STORAGE RINGS
PEP STORAGE RINGS
SUPERCONDUCTING SUPER COLLIDER
TRISTAN STORAGE RINGS
A storage ring for radioactive beams, 20:1606 (R;US)
Crystalline beams: The horizontal zigzag: Informal report, 20:1529 (R;US)
STORES
See COMMERCIAL BUILDINGS
STOVER
See AGRICULTURAL WASTES
STOWING
Cost optimization of mine design by means of filled stoping: Final report, 20:75 (R;DE;In German)
STRANGE PARTICLES
Strange particle and antiproton production in S + nucleus collisions at 200 GeV/nucleon, 20:2269 (R;US)
STRATEGIC DEFENSE INITIATIVE
See BALLISTIC MISSILE DEFENSE
STRATEGIC PETROLEUM RESERVE
Strategic petroleum reserve: Quarterly report, August 15, 1994, 20:981 (R;US)
STRAW
Utilization of straw- and wood pellets for fuelling of small heating systems, 20:628 (R;DK;In Danish)
STREAMS
See also RIVERS
Streamflow, specific-conductance, and temperature data for Bayou and Little Bayou Creeks near Paducah, Kentucky, August 15 and 16, 1989, 20:454 (R;US)
STRING MODELS
Central extension of a new W_{∞}-type algebra, 20:2050 (R;XA)
Semiglobal Alice strings, 20:2044 (R;XA)
String-loop corrections to effective action and black-hole instabilities, 20:2049 (R;XA)
Tachyon condensates and anisotropic universe, 20:2037 (R;XA)
STRONG INTERACTIONS
Constraints on T-odd and P-even hadronic interactions from nucleon, nuclear, and atomic electric dipole moments, 20:2080 (R;US)
Strong interactions studies with medium energy probes: Progress report, 1993–1994, 20:2079 (R;US)
STRONTIUM 90
Concentrations of tritium and strontium-90 in water from selected wells at the Idaho National Engineering Laboratory after purging one, two, and three borehole volumes, 20:1849 (R;US)
Determination of ^{90}Sr in grass and soil, 20:1335 (R;CH)
STRONTIUM COMPOUNDS
See also STRONTIUM OXIDES

Studies of the system Bi-Pb-Sr-Ca-Cu-O with different nominal composition., 20:1225 (IA;UA;In Russian)

STRONTIUM OXIDES
High-frequency acoustic sensors for operation in a gaseous medium: Final report, 20:1482 (R;US)
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)
Interlayer interactions in absorption and reflection spectra of bismuth HTSC crystals., 20:1234 (R;UA)
Vortex dynamics in a ring-like irradiated $Bi_2Sr_2CaCu_2O_8$ crystal, 20:2384 (R;US)

STRUCTURAL MATERIALS
See BUILDING MATERIALS

STRUCTURE (CRYSTAL)
See CRYSTAL STRUCTURE

STRUCTURE (MOLECULAR)
See MOLECULAR STRUCTURE

STRUCTURES (BUILDINGS)
See BUILDINGS

STRUCTURES (MECHANICS)
See MECHANICAL STRUCTURES

STUDS
See FASTENERS

STYRENE POLYMERS
See POLYSTYRENE

SU-2 GROUPS
Ground state properties and glueball spectrum in SU(2) Yang-Mills theory using gauge invariant variables, 20:2093 (R;FR)

SUBBITUMINOUS COAL
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)
Investigation of coal structure: Final report, 20:54 (R;US)

SUBCRITICALITY
See CRITICALITY

SUBSURFACE STRUCTURES
Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)

SUBURBS
See URBAN AREAS

SUGARS
See SACCHARIDES

SULFATE-REDUCING BACTERIA
Microbiology and physiology of anaerobic fermentations of cellulose: Progress report, April 30, 1991–April 30, 1992, 20:1847 (R;US)

SULFATES
See also SCANDIUM SULFATES
Site environmental report: 1993, 20:501 (R;US)

SULFONATES
Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)

SULFOX PROCESS
See DESULFURIZATION

SULFUR
Adsorption of sulfur on bimetallic surfaces: Formation of copper sulfides on Pt(111) and Ru(001), 20:1340 (R;US)
Advanced sulfur control concepts in hot-gas desulfurization technology: Quarterly report, April–June 1994, 20:16 (R;US)
Bridging the pressure gap: In situ atomic-level investigations of model platinum catalyst surfaces under reaction conditions by scanning tunneling microscopy, 20:1366 (R;US)
Model studies of hydrodesulfurization by Mo: The effect of promoters: Progress report, December 1, 1993–November 30, 1994, 20:1294 (R;US)

SULFUR CARBIDES
See CARBON SULFIDES

SULFUR COMPOUNDS
See also CARBON OXYSULFIDE
SULFATES
SULFUR FLUORIDES
SULFUR OXIDES
Photodissociation and photoionization of organosulfur radicals, 20:2294 (R;US)

SULFUR DIOXIDE
High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)
Investigation of combined SO_2/NO_x removal by ceria sorbents: Quarterly technical progress report, April 1, 1993–June 30, 1993, 20:65 (R;US)
LIFAC Sorbent Injection Desulfurization Demonstration Project: Quarterly report number 14, January–March, 1994, 20:67 (R;US)
Nitrogen and carbon oxides chemistry in the HRS retorting process, 20:141 (R;US)
Predictive models of circulating fluidized bed combustors: 14th Technical progress report, 20:87 (R;US)
Results of SO_2, NO_x, and CO monitoring at McMurdo Station, Antarctica, 20:1750 (R;US)

SULFUR FLUORIDES
Effect of a solid insulator on the spark yield of S_2F_{10} in SF_6*, 20:887 (R;US)

SULFUR HYDRIDES
See HYDROGEN SULFIDES

SULFUR OXIDES
See also SULFUR DIOXIDE
SULFUR TRIOXIDE
Control of coal combustion SO_2 and NO_x emissions by in-boiler injection of CMA: [Third quarterly progress report], 1 July 1994–30 September 1994, 20:739 (R;US)
Engineering development of advanced coal-fired low-emission boiler systems: Technical progress report No. 8, July–August 1994, 20:738 (R;US)
IGR NO_x/SO_x control technology: [Progress report], April 1–June 30, 1994, 20:736 (R;US)
Toxicologic evaluation of analytes from Tank 241-C-103, 20:512 (R;US)

SULFUR SULFIDES
See SULFUR

SULFUR TRIOXIDE
High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)

SULFURIC ACID
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)
Industrial gauge of sulphuric acid concentration, 20:603 (IA;PL)

SUPERALLOYS
See HEAT RESISTING ALLOYS

SUPERCONDUCTING CABLES
Current distribution in Cable-In-Conduit Conductors, 20:2433 (R;US)

SUPERCONDUCTING CAVITY RESONATORS
Thermal behaviour analysis of SRF cavities and superconducting HOM couplers: Numerical simulation and experimental results, 20:1554 (R;FR)

SUPERCONDUCTING COMPOSITES
Activation Energy
Activation energy of oxygen deficient YBCO, 20:2373 (IA;AU)
Cathodoluminescence
Spectral cathodoluminescence studies in $YBa_2 Cu_3 O_{7-x}$ and its related components, 20:1212 (IA;AU)
Critical Temperature
The relation between ultrasonic properties and the critical temperature in Fe doped BSCCO, 20:1203 (IA;AU)
Crystal Growth
Growth and surface microstructure of epitaxial $YBa_2Cu_3O_{7-x}$ thin films, 20:1252 (IA;AU)
Crystal Structure
^{197}Au Moessbauer analysis of gold-doped YBCO, 20:2337 (IA;AU)

Electric Conductivity
The decoupling between the superconducting layers in $Bi_2Sr_2CaCu_2O_8/Bi_2Sr_2Ca_2Cu_3O_10$ intergrowth single crystals, 20:1260 (IA;AU)

Electronic Structure
Electronic structural changes in Y_{1-x} Pr_x Ba_2 Cu_3 $O_{7-\delta}$ single crystals due to Pr4f states, 20:2395 (IA;AU)

Heat Treatments
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)

Impurities
Spectral cathodoluminescence studies in YBa_2 Cu_3 O_{7-x} and its related components, 20:1212 (IA;AU)

Ion Implantation
A study of transition metal implanted single crystal YBa_2 Cu_3 $O_{7-\delta}$, 20:1217 (IA;AU)

Josephson Effect
The decoupling between the superconducting layers in $Bi_2Sr_2CaCu_2O_8/Bi_2Sr_2Ca_2Cu_3O_10$ intergrowth single crystals, 20:1260 (IA;AU)

Microstructure
Growth and surface microstructure of epitaxial $YBa_2Cu_3O_{7-x}$ thin films, 20:1252 (IA;AU)
Structure and superconductivity in $YBaSrCu_{3-x}$ Sn_x O_y compound, 20:1196 (IA;AU)

Order-Disorder Transformations
Vortex-glass superconductivity in low magnetic field in YBa_2 Cu_3 O_{7-y}/V_2 O_5 composite, 20:1195 (IA;AU)

Praseodymium Oxides
Electronic structural changes in Y_{1-x} Pr_x Ba_2 Cu_3 $O_{7-\delta}$ single crystals due to Pr4f states, 20:2395 (IA;AU)

Structural Chemical Analysis
A study of transition metal implanted single crystal YBa_2 Cu_3 $O_{7-\delta}$, 20:1217 (IA;AU)

Transition Temperature
Structure and superconductivity in $YBaSrCu_{3-x}$ Sn_x O_y compound, 20:1196 (IA;AU)
Superconductivity of Fe-substituted Bi_2 Sr_2 Ca_1 Cu_2 O_x single crystals, 20:1218 (IA;AU)

Ultrasonic Testing
High-temperature ultrasonic characterization of Ag-clad superconductor tapes, 20:1478 (R;US)

Ultrasonic Waves
The relation between ultrasonic properties and the critical temperature in Fe doped BSCCO, 20:1203 (IA;AU)

Vortex Flow
Vortex-glass superconductivity in low magnetic field in YBa_2 Cu_3 O_{7-y}/V_2 O_5 composite, 20:1195 (IA;AU)

Yttrium Oxides
^{197}Au Moessbauer analysis of gold-doped YBCO, 20:2337 (IA;AU)

SUPERCONDUCTING DEVICES
See also SQUID DEVICES
SUPERCONDUCTING CAVITY RESONATORS
SUPERCONDUCTING MAGNETS
Fabrication and properties of long Bi2223 Ag-sheathed superconducting tapes, 20:1120 (IA;AU)

SUPERCONDUCTING FILMS
Current-carrying length scale in silver sheathed Bi-Pb-Sr-Ca-Cu-O tapes, 20:2382 (IA;AU)
Effect of columnar defects on the critical current anisotropy of epitaxial YBa_2 Cu_3 $O_{7-\delta}$ thin films and YBa_2 Cu_3 $O_{7-}\delta/PrBa_2$ Cu_3 $O_{7-\delta}$ multilayers, 20:1207 (IA;AU)
Microstructural and superconducting properties of Bi(2223)/Ag tapes during heat treatment process, 20:1193 (IA;AU)
Microstructure development and phase transformation of Ag-sheathed BI-2223 tapes, 20:1192 (IA;AU)
Production of superconducting thick films through cation chelated organic precursors, 20:1186 (IA;AU)
Relations between structural and superconducting properties of bulk and thin film high-T_c materials, 20:2386 (R;DK)
Strain tolerant multifilamentary Bi Pb-2223 tapes for power applications, 20:2381 (IA;AU)

SUPERCONDUCTING MAGNETS
Multipole contribution from an off-axis orbit in an IR quadrupole and the consequences on the dynamic aperture, 20:1609 (R;US)
Technology transfer for industrial production of superconducting magnets for the RHIC project at BNL, 20:1544 (R;US)
Theory and modelling of quench in cable-in-conduit superconducting magnets, 20:2432 (R;US)

SUPERCONDUCTING QUANTUM INTERFERENCE DEVICES
See SQUID DEVICES

SUPERCONDUCTING SUPER COLLIDER
Feasibility study of aluminum beam tube for the collider: An option for no-coating and no-liner, 20:1596 (R;US)
Final report of the SSC electrodesorption studies, 20:1599 (R;US)
Implementation of Beam-Loss Monitor systems for the SSC, 20:1597 (R;US)
The 12-GeV/c beam transfer and absorber lines for the Superconducting Super Collider, 20:1540 (R;US)
Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas, 20:1495 (R;US)

SUPERCONDUCTIVITY
51st (Spring 1994) Meeting on Cryogenics and Superconductivity, 20:1074 (I;JP;In Japanese)
How do the oxides and fullerides superconduct?, 20:1268 (IA;AU)
Nuclear-physical researches (Theory and experiments). Scientific-technical collection., 20:1222 (I;UA)
The defects of high J_c melt textured YBa_2 Cu_3 O_{7-x} superconductors, 20:1194 (IA;AU)

SUPERCONDUCTORS
See also HIGH-TC SUPERCONDUCTORS
TYPE-II SUPERCONDUCTORS
Carbon fiber reinforced superconductor composites: Final report, August 8, 1991–August 7, 1994, 20:1241 (R;US)
Charge density wave and Wigner crystal instabilities in electron-hole systems, 20:2367 (IA;AU)
Investigation of thermal conductivity in polymer-ceramic HTSC composites., 20:1279 (IA;UA;In Russian)
Low-temperature small refrigerating machinery and cryotechnical devices for the future use of high-temperature superconductors: Final report, 20:1499 (I;DE;In German)
Process of formation of gels in the systems (Y^{3+}-Ba^{3+}-Cu^{2+}) or (Bi^{3+}-Pb^{2+}-Sr^{2+}-Ca^{2+}-Cu^{2+})-CH_3COO-NH_4OH-H_2O and theirs transformation to high temperature superconductors (HTS): $YBa_2Cu_3O_{7-x}$ (YBCO) $Bi_2Sr_2Ca_1Cu_2O_{8+\delta}$ (BSCCO 2212), Bi_2Sr_2 $Ca_2Cu_3O_{10+\delta}$ (BSCCO 2223) and $Bi_{1.6}Pb_{0.4}Sr_2$ $Cu_3O_{10+\delta}$ (BSCCO 2223), 20:1220 (IA;PL)

SUPERCRITICAL FLOW
See TURBULENT FLOW

SUPERFUND
See US SUPERFUND

SUPERGRAVITY
Canonical formulation of gravitation- and supergravitation theories, 20:2008 (R;DE;In German)
The no-hair conjecture in 2D dilaton supergravity, 20:2090 (R;FR)

SUPERLATTICES
Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)
Excitons in semiconducting superlattices, quantum wells, and ternary alloys: Performance report, September 15, 1987–January 31, 1994, 20:1246 (R;US)
States above a quantum well in tilted magnetic fields, 20:2368 (IA;AU)

SUPERSYMMETRY
Aspects of scalar lepton search, 20:2137 (RA;DE)
Bound on the lightest Higgs mass in the minimal ηmodel at one loop, 20:2188 (RA;DE)
Detecting the non-minimal supersymmetric Higgs boson at the NLC, 20:2187 (RA;DE)
Discovering supersymmetry with electron and photon beams, 20:2138 (RA;DE)
Experimental aspects of rare top quark decays at future e^+e^- linear colliders, 20:2123 (RA;DE)

Perspectives of neutral supersymmetric Higgs boson searches at a 500 GeV e^+e^- linear collider, 20:2106 (RA;DE)
Radiative corrections in the MSSM Higgs sector: masses and fermionic decays, 20:2186 (RA;DE)
Radiative corrections to the supersymmetric Higgs sector, 20:2107 (RA;DE)
Search for neutral particles in nonminimal SUSY model, 20:2189 (RA;DE)
Supersymmetric decays of the top quark, 20:2122 (RA;DE)
Supersymmetry and Mathematics, 20:2065 (R;FR;In French)
T-odd asymmetry in chargino pair production processes, 20:2139 (RA;DE)
Vector bosons and Higgs bosons as signatures for charginos and neutralinos, 20:2136 (RA;DE)

SUPERVOLTAGE RADIOTHERAPY
See RADIOTHERAPY

SUPPLY AND DEMAND
Lectures on the Pacific rim region Coal Workshop 1993, 20:93 (I;JP;In Japanese)

SUPPORTS
See also FUEL RACKS
200 Area weekly report, 20:179 (R;US)
A user's guide to LUGSAN 1.1: A computer program to calculate and archive lug and sway brace loads for aircraft-carried stores, 20:2556 (R;US)

SURFACE BARRIER DETECTORS
Quantum well plasma effects in the tunneling current through a semiconductor double barrier structure, 20:2344 (IA;AU)

SURFACE COATING
Investigation of carbon-nitride depositions produced by high energy density discharge in nitrogen gas atmosphere, 20:1216 (IA;AU)

SURFACE CONTAMINATION
CSAR 81-001 addendum 2: Use of a plexiglass contamination barrier in HC-227-T, 20:527 (R;US)

SURFACE PROPERTIES
Empirical molecular dynamics calculations for the (001) and (111) reconstructed surfaces of diamond, 20:2325 (IA;AU)
Separation of flue-gas scrubber sludge into marketable products: Third quarterly technical progress report, June 1, 1994–August 31, 1994, 20:68 (R;US)

SURFACE WATERS
See also LAKES
SEAS
STREAMS
WATER RESERVOIRS
Concentrations of 23 trace elements in ground water and surface water at and near the Idaho National Engineering Laboratory, Idaho, 1988–91, 20:451 (R;US)
Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:465 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)
Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)

SURFACES
Advanced growth and surface analysis system for in situ studies of interface formation: Annual technical report, 20:2312 (R;US)
Image quality, surface statistics and all that, 20:2308 (R;US)
Photoemission and ferromagnetism, 20:2310 (R;US)

SURPLUS NUCLEAR FACILITIES
Decommissioning of facilities at the Savannah River Site, 20:540 (R;US)
Site characterization report for Building 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee: Environmental Restoration Program, 20:508 (R;US)

SURVEILLANCE (RADIOACTIVITY)
See RADIATION MONITORING

SURVEY (RADIOACTIVITY)
See RADIATION MONITORING

SUSPENSIONS (FUEL)
See FUEL SLURRIES

SWEAT GLANDS
See SKIN

SWEDEN
Development of nuclear power in Sweden, 20:965 (IA;PL)
Training for the qualification and competence of nuclear power plant personnel in Sweden, 20:2483 (RA;XA)

SWIRL FLOW
See VORTEX FLOW

SWITCHING CIRCUITS
Characteristics and development report for the MC3994 and MC3994A relays, 20:1504 (R;US)

SWITZERLAND
Grimsel test site: preparation and performance of migration experiments with radioisotopes of sodium, strontium and iodine, 20:1832 (R;CH)

SWORDFISH EVENT
See NUCLEAR EXPLOSIONS
UNDERWATER EXPLOSIONS

SYMMETRY GROUPS
Discrete symmetries in the Weyl expansion for quantum billiards, 20:1998 (R;FR)

SYMPOSIA
See MEETINGS

SYNCHROTRON RADIATION
Advanced growth and surface analysis system for in situ studies of interface formation: Annual technical report, 20:2312 (R;US)
Applications of synchrotron radiation to materials science and the Australian National Beamline Facility at the Photon Factory, 20:2338 (IA;AU)
Effects of RF side-bands on spectral reproducibility for infrared synchrotron radiation, 20:1528 (R;US)
Transvenous coronary angiography in humans with synchrotron radiation, 20:1872 (R;US)

SYNTHESIS GAS
High temperature membranes for H_2S and SO_2 separations: Quarterly progress report, April 1, 1994–June 30, 1994, 20:32 (R;US)
The economical production of alcohol fuels from coal-derived synthesis gas: Eleventh quarterly technical progress report, April 1, 1994–June 30, 1994, 20:33 (R;US)

SYNTHETIC FUELS REFINERIES
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993), 20:29 (R;US)

SYNTHETIC-APERTURE RADAR
Synthetic aperture radar processing with polar formatted subapertures, 20:1667 (R;US)

SYNTHINE PROCESS
See FISCHER-TROPSCH SYNTHESIS

SYRIAN HAMSTER
See HAMSTERS

SYRUPS
See MOLASSES

T

T INVARIANCE
T-odd asymmetry in chargino pair production processes, 20:2139 (RA;DE)

TANK FARMS
See STORAGE FACILITIES

TANKS
Capacity
Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility, 20:365 (R;US)
Compiled Data
Tank characterization reference guide, 20:418 (R;US)
Construction
200 Area weekly report, 20:170 (R;US)

Position paper, need for additional waste storage capacity and recommended path forward for project W-236a, Multi-function Waste Tank Facility, 20:365 (R;US)

Cooling Systems
200 Area weekly report, 20:177 (R;US)

Corrosion
B Plant low level waste system integrity assessment plan, 20:425 (R;US)

Corrosion Resistance
Dual shell pressure balanced reactor vessel: Final project report, 20:304 (R;US)

Cracks
TWRS corrosion monitoring program plan, 20:403 (R;US)

Data Acquisition Systems
DACS upgrade acceptance test procedure, 20:373 (R;US)

Data Analysis
Statistical characterization report for Single-Shell Tank 241-T-107, 20:417 (R;US)

Degassing
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Hazard assessments of double-shell flammable gas tanks, 20:533 (R;US)
Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)

Design
200 Area weekly report, 20:165 (R;US)
200 Area weekly report, 20:174 (R;US)
241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1, 20:370 (R;US)
Design/Installation and Structural Integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory, 20:244 (R;US)
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)
Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances, 20:332 (R;US)

Flammability
Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)

Installation
Design/Installation and Structural Integrity assessment of Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2649 (Transported Waste Receiving Facility) at Oak Ridge National Laboratory, 20:244 (R;US)
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)

Inventories
Supporting document for the historical tank content estimate for A Tank Farm, 20:385 (R;US)
Supporting document for the historical tank content estimate for B Tank Farm, 20:387 (R;US)
Supporting document for the historical tank content estimate for BY Tank Farm, 20:389 (R;US)
Supporting document for the historical tank content estimate for S tank farm, 20:391 (R;US)

Mechanical Properties
Effect of gravitation on dynamic response of tanks containing two liquids, 20:220 (R;US)

Monitoring
B Plant low level waste system integrity assessment plan, 20:425 (R;US)
Computer system requirements specification for 101-SY hydrogen mitigation test project data acquisition and control system (DACS-1), 20:378 (R;US)
DACS upgrade acceptance test procedure, 20:373 (R;US)
Functional design criteria for SY-101 hydrogen mitigation test project Data Acquisition and Control System (DACS-1), 20:402 (R;US)
TWRS corrosion monitoring program plan, 20:403 (R;US)
Tank Monitor and Control System sensor acceptance test procedure: Revision 5, 20:372 (R;US)
Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)

Planning
200 Area weekly report, 20:183 (R;US)

Radioactive Waste Storage
200 Area weekly report, 20:180 (R;US)
200 Area weekly report, 20:171 (R;US)

Remedial Action
A review of technology for contact protection of remediation manipulators (WHC Issue 39), 20:513 (R;US)
Acceptance test procedure, 241-SY-101/241-C-106 shot loading system, 20:374 (R;US)
Radiological containment selection, design, and specification guide, 20:381 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 2: Final report, 20:519 (R;US)
Risk-based systems analysis of emerging high-level waste tank remediation technologies: Volume 1: Executive summary, 20:518 (R;US)
Tank characterization report for Single-Shell Tank B-111, 20:299 (R;US)

Remote Viewing Equipment
Conceptual design analyses for Hanford Site deployable remote spectroscopy systems, 20:413 (R;US)

Safety Analysis
Design/installation and structural integrity assessment under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory, 20:243 (R;US)
Summary report on the design of the retained gas sampler system (retained gas sampler, extruder and extractor), 20:397 (R;US)

Sampling
Core sample truck improvement test report, 20:422 (R;US)
In situ sampling device development engineering task plan, 20:398 (R;US)
Statistical characterization report for Single-Shell Tank 241-T-107, 20:417 (R;US)
Tank characterization report for Single-Shell Tank 241-T-107, 20:396 (R;US)
Tank characterization report for Single-Shell Tank B-111, 20:299 (R;US)
Tank characterization report for Single-Shell Tank T-102, 20:300 (R;US)
Waste behavior analysis for tank 241-SY-103, 20:419 (R;US)

Seismic Effects
Implementation of seismic design and evaluation guidelines for the Department of Energy high-level waste storage tanks and appurtenances, 20:332 (R;US)

Service Life
CSER 91-003, Addendum 1: Criticality Safety Evaluation Report for postponed retrieval of three container sequences in the burial ground, 20:351 (R;US)

Stability
Tank characterization report for Single-Shell Tank 241-T-107, 20:396 (R;US)

Stresses
241-AP waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:369 (R;US)
241-AV/AZ waste storage tanks: Supplemental gravity load analysis: Volume 2, 20:371 (R;US)

Surveillance
Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)
Testing
241-AY/AZ waste storage tanks: Supplemental gravity load analysis: Volume 1, 20:370 (R;US)
Thermal Analysis
Ferrocyanide safety program: Thermal analysis of ferrocyanide Watch List tanks, Group II, 20:326 (R;US)
Void Fraction
Void fraction instrument acceptance test procedure, 20:1676 (R;US)

TANTALUM
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)

TANTALUM 181 TARGET
The properties of nucleon clusters production in (p, d) + Ta and (p, d) + C interactions over energy range from 4.2 to 10 GeV/c per nucleon, 20:2263 (R;XJ;In Russian)

TANTALUM ALLOYS
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)

TARGETS
See also ALUMINIUM 27 TARGET
BERYLLIUM 9 TARGET
CARBON 12 TARGET
CARBON 13 TARGET
DYSPROSIUM 163 TARGET
EINSTEINIUM 254 TARGET
GOLD 197 TARGET
HAFNIUM 178 TARGET
HYDROGEN 1 TARGET
ION BEAM TARGETS
LASER TARGETS
LITHIUM 6 TARGET
LUTETIUM 175 TARGET
PLUTONIUM 239 TARGET
TANTALUM 181 TARGET
THULIUM 169 TARGET
URANIUM 235 TARGET
URANIUM 238 TARGET
Characterization of aluminum clad fuels and targets for long-term storage, 20:211 (R;US)

TAU LEPTONS
See TAU PARTICLES

TAU NEUTRINOS
Upper limit determination for the τneutrino mass with OPAL detector, 20:2185 (R;DE;In German)

TAU PARTICLES
Light quark masses from exclusive tau decays: An experimental proposal, 20:2195 (R;FR)

TAUONS
See TAU PARTICLES

TAXES
Survey on econometric analysis of petroleum substitution energy for fiscal 1993, 20:1094 (R;JP;In Japanese)

TBP
Evaluation of pretreatment processes for supercritical water oxidation, 20:267 (R;US)
Radiolysis of tri-n-butyl phosphate solutions effect of absorbed dose on extractability of uranium fission products and nitric acid, 20:159 (R;EG)

TEAK EVENT
See NUCLEAR EXPLOSIONS

TECHNICAL INFORMATION CENTER
See US DOE

TECHNOLOGY TRANSFER
A model technology transfer program for independent operators: Kansas Technology Transfer Model (KTTM), 20:112 (R;US)
Advances in technology transfer at Federal Facilities, 20:937 (R;US)
Partnering with Sandia National Laboratories through alliances or consortia, 20:936 (R;US)
The United States Department of Energy Office of Industrial Technology's Technology Benefits Recording System, 20:931 (R;US)

TEMPERATURE DISTRIBUTION
Interannual variability of north Atlantic Sea surface temperatures, 20:1714 (RA;US)
On the differences between early and middle winter atmospheric responses to sea surface temperature anomalies in the northwest Atlantic, 20:1731 (RA;US)

TEMPERATURE MEASUREMENT
Calibration of simulated temperature histories of sedimentary basins, 20:104 (R;DE;In German)

TENNESSEE VALLEY AUTHORITY
Wastes and by-products - alternatives for agricultural use, 20:1035 (R;US)

TENSOR MESONS
Measurement of the reaction anti pp→ΦΦ at the experiment JETSET, 20:2168 (R;DE;In German)

TERBIUM ALLOYS
Magnetization and magnetostriction in highly magnetostrictive materials, 20:1145 (R;US)

TERRESTRIAL ECOSYSTEMS
Report on joint ecogeochemical mapping and monitoring in the West Murmansk Region and the contiguous areas of Finland and Norway, 20:1823 (R;NO)
The effect of regional-scale soil-moisture deficits on mesoscale atmospheric dynamics that influence fire severity, 20:1772 (R;US)

TERTIARY RECOVERY
See ENHANCED RECOVERY

TEST FACILITIES
FY 1993 progress report on the ANS thermal-hydraulic test loop operation and results, 20:863 (R;US)
Initial tank calibration at NUCEF critical facility. 2: Data analysis, 20:1439 (R;JP;In Japanese)

TEST PARTICLES
Quasiparticles in magnetized plasma, 20:2416 (R;UA)

TEST WELLS
See EXPLORATORY WELLS

TESTING (MATERIALS)
See MATERIALS TESTING

TETRACHLOROMETHANE
See CARBON TETRACHLORIDE

TEVATRON
See FERMILAB TEVATRON

TEWA EVENT
See NUCLEAR EXPLOSIONS

TEXAS
An evaluation of known remaining oil resources in the state of Louisiana and Texas: Volume 3, Project on Advanced Oil Recovery and the States, 20:108 (R;US)

TFTR DEVICE
See TFTR TOKAMAK

TFTR REACTORS
See TFTR TOKAMAK

TFTR TOKAMAK
D-T radiation effects on TFTR diagnostics, 20:2420 (R;US)
Fusion power production in TFTR, 20:2444 (R;US)
Heating and transport in TFTR D-T plasmas, 20:2417 (R;US)
ICRF heating of deuterium-tritium plasmas in TFTR, 20:2422 (R;US)
ICRF-induced DD fusion product losses in TFTR, 20:2419 (R;US)
Review of recent D-T experiments from TFTR, 20:2443 (R;US)

THAILAND
Present status of radiation utilization in Thailand, 20:2512 (IA;JP)

THALLIUM OXIDES
Superconducting $Tl_2Ba_2CaCu_2O_8$ thin films prepared by post-annealing in a flow-through multiple-zone furnace, 20:1238 (R;US)

THERMAL ANALYSIS
CHEMCON user's manual: Version 1.1, 20:2435 (R;US)

THERMAL CONDUCTION
COYOTE II - a finite element computer program for nonlinear heat conduction problems: Part I - theoretical background, 20:1477 (R;US)

THERMAL EFFLUENTS
Experimental drifts of juvenile chinook salmon through effluent discharges at Hanford in 1968, 20:447 (R;US)
Exploratory studies of the interactions of gas supersaturation and temperature on mortality of juvenile salmonids, 20:637 (R;US)
Food and feeding of juvenile chinook salmon in the central Columbia River in relation to thermal discharges and other environmental features, 20:448 (R;US)

THERMAL ENERGY STORAGE EQUIPMENT
Performance indicators for solar pipes with phase change storage (SOLCOM I 1994.), 20:658 (IA;IL)

THERMAL EXPANSION
Glassy thermal expansion of cubic stabilised zirconia alloys, 20:1199 (IA;AU)

THERMAL INSULATION
Optimizing the effective conductivity and cost of gas-filled panel thermal insulations, 20:1026 (R;US)
The North Carolina Field Test: Field performance of the preliminary version of an advanced weatherization audit for the Department of Energy's Weatherization Assistance Program, 20:1029 (R;US)

THERMAL NEUTRONS
New thermal neutron scattering files for ENDF/B-VI release 2, 20:2266 (R;US)

THERMAL POLLUTION (AIR)
See AIR POLLUTION

THERMAL TRANSMISSION ICES
Promoted structuring of model to introduce petroleum substitution energy in Hokkaido's New City Base for Regional Administration of Industry and Culture, 20:1060 (I;JP;In Japanese)

THERMOCHEMICAL PROCESSES
See also COMBUSTION
Brown coal liquefaction project.: Technical summary, 20:42 (I;JP;In Japanese)
Importance and problems of coal conversion technology before 2010, 20:44 (I;JP;In Japanese)

THERMOELECTRIC CELLS
See THERMOELECTRIC GENERATORS

THERMOELECTRIC CONVERTERS
See THERMOELECTRIC GENERATORS

THERMOELECTRIC GENERATORS
Conceptual design of an RTG Facility Transportation System, 20:1002 (R;US)
GPHS-RTGs in support of the Cassini Mission: Semi annual technical progress report, 28 March 1994–25 September 1994, 20:609 (R;US)
Modular Radioisotope Thermoelectric Generator (RTG) Program: Final technical report, 20:608 (R;US)
Radioisotope Thermoelectric Generator Package O-Ring Seal Material Validation Testing, 20:1005 (R;US)
Research on the power generation system with thermoelectric conversion elements, 20:1003 (R;JP;In Japanese)

THERMOELECTRIC MATERIALS
Sputter deposition of multilayer thermoelectric films: An approach to the fabrication of two-dimensional quantum wells, 20:1004 (R;US)

THERMOELECTRIC PROPERTIES
Thermoelectric power of YBCO: Ag composite superconductors, 20:2372 (IA;AU)

THERMOLUMINESCENT DOSEMETERS
Electronic stability and reproducible accuracy of HARSHAW 2000(A,B) TLD-analyzer, 20:1480 (R;EG)

THERMOLUMINESCENT DOSIMETRY
The production of thermoluminescence dosemeter, $CaSO_4$(Dy), 20:1633 (IA;TH;In Thai)

THERMONUCLEAR REACTOR MATERIALS
A summary and assessment of oxidation driven volatility experiments at the INEL and their application to fusion reactor safety assessments, 20:2434 (R;US)
Assessment of database for interaction of tritium with ITER plasma facing materials, 20:2436 (R;US)
Benchmark experiment on a copper slab assembly bombarded by D-T neutrons, 20:2439 (R;JP)
Properties of V-4Cr-4Ti for application as fusion reactor structural components, 20:1100 (R;US)

THERMONUCLEAR REACTORS
See also ION BEAM FUSION REACTORS
Fusion Canada: Issue 1, 20:2438 (I;CA;In English, French)

THERMONUCLEAR WEAPONS
See NUCLEAR WEAPONS

THICKNESS GAGES
Isotope gauge and computer program for quality control of thickness coating process, 20:602 (IA;PL)

THIN FILMS
Advanced processing technology for high-efficiency, thin-film $CuInSe_2$ and CdTe solar cells: Annual subcontract report, 1 March 1993–28 February 1994, 20:687 (R;US)
Atmosphere influence on in situ ion beam analysis of thin film growth, 20:1291 (R;US)
Electron spin resonance and intrinsic stress measurements on diamond synthesized by plasma assisted chemical vapour deposition, 20:1253 (IA;AU)
Fabrication and characterisation of thin film tetrahedral amorphous carbon, 20:1256 (IA;AU)
Molecular dynamic study of compressive stress generation, 20:2354 (IA;AU)
New automatic RBS/channeling system for thin film material analysis, 20:2331 (IA;AU)
Photoemission and ferromagnetism, 20:2310 (R;US)
Preparation and characterisation of certain conducting polymer thin film devices, 20:1254 (IA;AU)
Process optimization and characterization of Ni-Ge-Au ohmic contacts to n^+ GaAs heterostructures, 20:1137 (IA;AU)
Stability of polypyrrole tapes at high current densities, 20:1267 (IA;AU)
YBCO thin film deposition by cathodic arc and laser ablation, 20:1185 (IA;AU)

THIOPHENE
Dynamic NMR studies of restricted arene rotation in the chromiu tricarbonyl thiophene and selenophene complexes, 20:1363 (R;US)

THIOPHENES
See POLYCYCLIC SULFUR HETEROCYCLES

THORIUM 232
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)

THORIUM ISOTOPES
See also THORIUM 232
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

THORON
See RADON 220

THULIUM 169 TARGET
The investigation of the cross sections of Po isotopes formation in the $^{27}Al + ^{175}Lu$ and $^{31}P + ^{169}Tm$ reactions, 20:2265 (R;XJ;In Russian)

THYLOX PROCESS
See DESULFURIZATION

THYMOCYTES
Analysis of the clonality of prelymphoma cells and approach to the study of initial events on radiation-induced lymphomagenesis, 20:1937 (RA;JP;In Japanese)
Cell interaction in the thymic microenvironment, 20:1936 (RA;JP;In Japanese)

THYROID
P53 in differentiation of thyroid cancer, 20:1932 (RA;JP;In Japanese)
TIME-OF-DAY PRICING
See TIME-OF-USE PRICING
TIME-OF-FLIGHT SPECTROMETERS
The slow proton position-sensitive time of flight detector of the GAMS NA12/2 experiment at CERN, 20:1585 (R;FR)
TIME-OF-SEASON PRICING
See TIME-OF-USE PRICING
TIME-OF-USE PRICING
The role of DSM in a competitive market, 20:985 (R;US)
TIME-REVERSAL INVARIANCE
See T INVARIANCE
TIN 101
Beta decay of the new isotope ^{101}Sn, 20:2226 (R;DE)
TITANATES
See also PZT
Enviropower hot gas desulfurization pilot, 20:7 (R;US)
High temperature alkali corrosion of dense SiC and Si_3N_4 coated with CMZP and Mg-doped Al_2TiO_5 in coal gas: Quarterly progress report No. 1, June 3–August 31, 1994, 20:1177 (R;US)
TITANIUM
A new universal solution for the electrofinishing of metallic materials, 20:1143 (R;US)
TITANIUM ALLOYS
See also TITANIUM BASE ALLOYS
Plastic deformation of ordered intermetallic alloys: Fundamental aspects, 20:1107 (R;US)
Properties of V-4Cr-4Ti for application as fusion reactor structural components, 20:1100 (R;US)
TITANIUM ARSENIDES
See TITANIUM COMPOUNDS
TITANIUM BASE ALLOYS
Theoretical study of the noble metals on semiconductor surfaces and Ti-base shape memory alloys, 20:1146 (R;US)
Tribology and surface mechanical properties of excimer laser nitrided titanium, 20:1158 (R;US)
TITANIUM COMPOUNDS
See also TITANATES
TITANIUM HYDRIDES
TITANIUM NITRIDES
TITANIUM OXIDES
An investigation of the chemical and physical properties of pristine, electrochromically damaged, and photochromically damaged $KTiOPO_4$ (KTP) using surface analytical and optical spectroscopic techniques, 20:1503 (R;US)
Performance of crystalline silicotitanates for cesium removal from Hanford tank waste simulants, 20:317 (R;US)
TITANIUM HYDRIDES
Development of highly effective neutron shields and neutron absorbing materials, 20:1249 (IA;JP)
TITANIUM NITRIDES
Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)
TITANIUM OXIDES
Massively parallel studies of the electronic structure of disordered micro-crystallites of transition metal oxides, 20:1210 (IA;AU)
Photocatalytic degradation of atrazine using TiO_2-impregnated mesh, 20:1371 (R;US)
Photocatalytic destruction of atrazine using TiO_2 mesh, 20:1372 (R;US)
Photoinduced charge transfer between fullerenes and TiO_2 semiconductor colloids, 20:1373 (R;US)
TLD (DOSEMETERS)
See THERMOLUMINESCENT DOSEMETERS
TLD (DOSIMETRY)
See THERMOLUMINESCENT DOSIMETRY
TLD SYSTEMS
See THERMOLUMINESCENT DOSEMETERS
TOBACCO
The structures and functions of oligosaccharins, 20:1892 (R;US)
TOKAMAK DEVICES
See also ITER TOKAMAK
MTX TOKAMAK
PBX DEVICES
TFTR TOKAMAK
CHEMCON user's manual: Version 1.1, 20:2435 (R;US)
Theory of the L-H transition, 20:2408 (R;US)
TOKAMAK FUSION TEST REACTOR
See TFTR TOKAMAK
TOOLS
Aerosol can puncture device operational test plan, 20:356 (R;US)
TOOLS (EDUCATIONAL)
See EDUCATIONAL TOOLS
TOP PARTICLES
A precision measurement of the branching ratio $\Gamma_{bar{l}b}/\Gamma_{had}$ in the e^+e^- annihilation on the Z^0 resonance, 20:2180 (R;DE;In German)
Comment on the average momentum of top quarks in the threshold region, 20:2076 (RA;DE)
Energy of W distribution in top quark decays, 20:2121 (RA;DE)
Evidence for $t\bar{t}$ production at the Tevatron: Statistical significance and cross section, 20:2191 (R;US)
Experimental aspects of rare top quark decays at future e^+e^- linear colliders, 20:2123 (RA;DE)
Radiative corrections to $e^+e^-\rightarrow\mu^+\mu^-$ and the top decay $t\rightarrow bW$ in the Two Higgs doublet model, 20:2108 (RA;DE)
Supersymmetric decays of the top quark, 20:2122 (RA;DE)
The top width: Theoretical update, 20:2120 (RA;DE)
TOPAZ REACTOR
Real-time dynamic simulator for the Topaz II reactor power system, 20:792 (R;US)
TOPONIUM
Production and decay of t anti t pairs in the threshold region, 20:2127 (RA;DE)
TOPSOE-SNPA PROCESS
See DESULFURIZATION
TOTAL SUSPENDED PARTICULATES
Results of PM_{10} and TSP monitoring at McMurdo Station, Antarctica, 20:1751 (R;US)
TOTAL-ABSORPTION SPECTROMETERS
See SHOWER COUNTERS
TOXIC MATERIALS
Relocation and repair of the National Geotechnical Centrifuge: Final report, 20:1440 (R;US)
Toxic Chemical System (TCS), 20:1368 (R;US)
TRACE AMOUNTS
The scavenging of atmospheric pollutants by clouds and precipitation by means of a vertical wind tunnel: Final report, 20:1743 (R;DE;In German)
TRACE ELEMENTS
See TRACE AMOUNTS
TRACER TECHNIQUES
A method of gallium purification from arsenic, bismuth, cadmium and iron by gallium remelting under synthetic slags, 20:597 (IA;PL)
Application of tracer method for selection of optimal location of industrial effluent outfall into the river, 20:593 (IA;PL)
Investigation of industrial effluent dilution and self-purification in the river, 20:592 (IA;PL)
Multi-points mobile radiotracer laboratory, 20:604 (IA;PL)
Nuclear technology in hydrological and environmental research, 20:589 (IA;PL)
Radiotracer investigation of the six-drawing machine glass furnace for flat glass production, 20:594 (IA;PL)
The dynamics of extraction column, 20:595 (IA;PL)
The effects of new fuel additives on carbon deposition and wear of combustion engines (Using radiotracers.), 20:596 (IA;PL)
TRACK DETECTORS (DIELECTRIC)
See DIELECTRIC TRACK DETECTORS
TRAINING
Interregional and regional training courses 1994, 20:2488 (RA;XA)
Quality assurance technical cooperation and training, 20:2492 (RA;XA)

Referential approach, 20:2473 (RA;XA)
Training-related infrastructure development and evaluation of training performance, 20:2491 (RA;XA)
[Guidelines for IAEA fellows and trainees], 20:2576 (RA;XA)

TRANSFER (HEAT)
See HEAT TRANSFER

TRANSFER (IN ENVIRONMENT)
See RADIONUCLIDE MIGRATION

TRANSFER (MASS)
See MASS TRANSFER

TRANSFORMATIONS (PHASE)
See PHASE TRANSFORMATIONS

TRANSFORMERS
The feasibility of replacing or upgrading utility distribution transformers during routine maintenance, 20:885 (R;US)

TRANSGENIC MICE
Effect of radiation on transgenic mice carrying a variety of oncogenes, 20:1929 (RA;JP;In Japanese)
TL transgenic mouse strains, 20:1930 (RA;JP;In Japanese)

TRANSIENTS
Dynamic compensation of the silver self-powered neutron detector in the ramp program at Osiris reactor, 20:824 (R;FR)

TRANSITION ELEMENT COMPLEXES
See also CHROMIUM COMPLEXES
OSMIUM COMPLEXES
RHENIUM COMPLEXES
RUTHENIUM COMPLEXES
SCANDIUM COMPLEXES
TUNGSTEN COMPLEXES
YTTRIUM COMPLEXES
EPR investigations of iminoxy free radicals and paramagnetic metal-oxime systems, 20:1352 (IA;PL)

TRANSITION ELEMENTS
See also CHROMIUM
COBALT
COPPER
GOLD
IRON
NICKEL
SILVER
TANTALUM
TITANIUM
TUNGSTEN
VANADIUM
ZIRCONIUM
Structural and thermodynamic properties of 3-d transition metals: Pseudopotential theory revisited, 20:1347 (R;XA)

TRANSITION METALS
See TRANSITION ELEMENTS

TRANSITIONS (PHASE)
See PHASE TRANSFORMATIONS

TRANSMISSION (HEAT)
See HEAT TRANSFER

TRANSMUTATION
Transmutation of nuclear wastes: A working report to Nupecc, 20:284 (R;FR)

TRANSPORT REGULATIONS
Automated Transportation Management System (ATMS) user's manual: Revision 1, 20:209 (R;US)
New regulation of radioactive materials transport, 20:187 (R;FR;In French)

TRANSPORT THEORY
Fast algorithms for transport models: Final report, 20:2278 (R;US)

TRANSPORTATION SECTOR
Alternative propellants and sustainable development: Pilot-project-report, 20:1095 (R;DK;In Danish)

TRANSPORTATION SYSTEMS
Site Support Program Plan for ICF Kaiser Hanford Company, 20:2522 (R;US)

TRANSURANIUM ELEMENTS
See also PLUTONIUM
Methods for estimating the content of transuranium and other difficult to measure nuclides in produced rad waste from BWRs, 20:215 (R;SE)
Study on alpha-spectrometry of transuranic elements in environmental samples, 20:1312 (IA;TH;In Thai)

TRANSURANIUM WASTES
See ALPHA-BEARING WASTES

TRAPPED ELECTRONS
Electron interaction with stabilizing matrix, 20:1383 (IA;PL)

TRI-GAS PROCESS
See COAL GASIFICATION

TRIBUTYL PHOSPHATE
See TBP

TRIGGER CIRCUITS
The D0 Level 1.5 Calorimeter Trigger, 20:1624 (R;US)
Triggers for a high sensitivity charm experiment, 20:1548 (R;US)

TRIPLET PARTICLES
See QUARKS

TRISTAN PROJECT
See TRISTAN STORAGE RINGS

TRISTAN STORAGE RINGS
A light scalar top search by venus detector, 20:2174 (RA;JP)
Can stop be light enough for TRISTAN?, 20:2173 (RA;JP)

TRITIUM
A two-dimensional simulation of tritium transport in the vadose zone at the Nevada Test site, 20:1850 (R;US)
Assessment of database for interaction of tritium with ITER plasma facing materials, 20:2436 (R;US)
Assessment of potential impacts of major groundwater contaminants to fall chinook salmon (Oncorhynchus tshawytscha) in the Hanford Reach, Columbia River, 20:1969 (R;US)
Concentrations of tritium and strontium-90 in water from selected wells at the Idaho National Engineering Laboratory after purging one, two, and three borehole volumes, 20:1849 (R;US)
Confirmatory experiments for the United States Department of Energy Accelerator Production of Tritium Program: Neutron, triton and radionuclide production by thick targets of lead and tungsten bombarded by 800 MeV protons, 20:1587 (R;US)
Plutonium and tritium produced in the Hanford Site production reactors, 20:563 (R;US)
Preconceptual engineering design for the APT ^{3}He Target/Blanket concept, 20:1693 (R;US)
Safety approach and engineered safety systems for the APT ^{3}He Target/Blanket System, 20:1694 (R;US)

TROPOSPHERE
Budgets and balances in a warmer world, 20:1710 (RA;US)
Effects of tropospheric aerosols on radiative flux calculations at UV and visible wavelengths, 20:1770 (R;US)

TRU WASTES
See ALPHA-BEARING WASTES

TRUCKS
Stress analysis of core sampler truck number 2 platform: 2,000 LBF crane lift capacity, 20:1459 (R;US)

TRYPTOPHAN
Indirect chiral effect alanines and tryptophans, 20:1408 (IA;PL)

TSL PROCESS
Catalysts and process developments for two-stage liquefaction: Final technical report, October 1, 1989–September 30, 1992, 20:20 (R;US)

TSP
See TOTAL SUSPENDED PARTICULATES

TUBES
The formation of coatings on heat exchanger pipe bundles subjected to transverse flow, 20:1469 (I;DE;In German)

TUBES (CONDUITS)
See PIPES

TUFF
A large block heater test for high level nuclear waste management, 20:322 (R;US)
Evaluation of thermo-hydrological performance in support of the thermal loading systems study, 20:320 (R;US)
Validation studies for assessing unsaturated flow and transport through fractured rock, 20:1824 (R;US)

TUMORS
See NEOPLASMS
TUNGSTEN
Confirmatory experiments for the United States Department of Energy Accelerator Production of Tritium Program: Neutron, triton and radionuclide production by thick targets of lead and tungsten bombarded by 800 MeV protons, 20:1587 (R;US)
TUNGSTEN ALLOYS
Tungsten-uranium penetrator target interaction, 20:1156 (R;US)
TUNGSTEN COMPLEXES
The ESR-spectroelectrochemical detection of organometallic W(+1) complex compounds, 20:1356 (IA;PL)
TUNNEL EFFECT
Tight binding calculations of the surface electronic DOS of graphite, 20:2304 (IA;AU)
Tunneling current in $Al_x Ga_{1-x}$ As/ $Al_y Ga_{1-y}$ As/GaAs double barrier quantum well structures, 20:2393 (IA;AU)
TUNNELS
Underground facility for geoenvironmental and geotechnical research at the SSC Site in Texas, 20:1495 (R;US)
TURBINE BLADES
Damage detection and health monitoring of operational structures, 20:1445 (R;US)
Fatigue properties and design of wing blades for wind turbines: Final report for the period April 1, 1990 to March 31, 1993, 20:723 (R;DK)
Reliability analysis of complex components using the stochastic finite element method, 20:733 (R;DE;In German)
TURBINES
See also GAS TURBINES
STEAM TURBINES
WIND TURBINES
Scale-up and modeling of forced chemical vapor infiltration, 20:725 (R;US)
TURBULENT FLOW
A computational model for coal transport and combustion: Quarterly technical progress report, June 1, 1994–August 31, 1994, 20:78 (R;US)
Laser Doppler anemometric measurement of two speed components in turbulent channel flow, 20:1470 (I;DE;In German)
Measurement of two velocity components in the vicinity of the wall of a turbulent fluid flow by means of a Laser-Doppler-Anemometer submerged into the fluid, 20:1467 (I;DE;In German)
TVA
See TENNESSEE VALLEY AUTHORITY
TVO-1 REACTOR
Ageing study of protection automation components of Olkiluoto nuclear power plant, 20:754 (R;FI;In Finnish)
Experience based reliability centered maintenance: An application on motor operated valve drives, 20:753 (R;FI)
Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1993 and annual summary, 20:751 (R;FI)
The protection and inspection of prestressing tendons in containment structures of nuclear power plants, 20:752 (R;FI;In Finnish)
TVO-2 REACTOR
Ageing study of protection automation components of Olkiluoto nuclear power plant, 20:754 (R;FI;In Finnish)
Experience based reliability centered maintenance: An application on motor operated valve drives, 20:753 (R;FI)
Operation of Finnish nuclear power plants: Quarterly report 4th quarter, 1993 and annual summary, 20:751 (R;FI)
The protection and inspection of prestressing tendons in containment structures of nuclear power plants, 20:752 (R;FI;In Finnish)
TWO-DIMENSIONAL CALCULATIONS
Do fragment multiplicity distributions obey any kind of scaling ?, 20:2232 (R;XJ)
TWO-PHASE FLOW
RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3, 20:877 (R;US)
TYCO PROCESS
See DESULFURIZATION
TYPE-II SUPERCONDUCTORS
Current-carrying length scale in silver sheathed Bi-Pb-Sr-Ca-Cu-O tapes, 20:2382 (IA;AU)
Flux jumps in magnetization loops of melt-textured Y-Ba-Cu-O, 20:1200 (IA;AU)
The behaviour of oxygen related defects in BSCCO near the critical temperature, 20:1205 (IA;AU)
The effect of silver on the I-V characteristics of BSCCO silver-sheathed tapes, 20:1206 (IA;AU)
TYPE-III SUPERCONDUCTORS
See TYPE-II SUPERCONDUCTORS
2-DIMENSIONAL CALCULATIONS
See TWO-DIMENSIONAL CALCULATIONS
2-METHYLPROPENE
Fundamental studies of fuel chemistry as related to internal combustion engine phenomena: Technical progress report, July 1, 1988–June 30, 1989, 20:130 (R;US)

U

U-1 GROUPS
Generalized NLS hierarchies from rational W algebras, 20:2064 (R;FR)
UAR
See EGYPTIAN ARAB REPUBLIC
UCLBL
See LAWRENCE BERKELEY LABORATORY
UCLLL
See LAWRENCE LIVERMORE LABORATORY
UHDE-PFIRRMANN PROCESS
See COAL LIQUEFACTION
UINTA BASIN
Increased oil production and reserves from improved completion techniques in the Bluebell Field, Uinta Basin, Utah, 20:97 (R;US)
UJM
See JET MODEL
ULTRACENTRIFUGE ENRICHMENT PLANTS
See CENTRIFUGE ENRICHMENT PLANTS
ULTRAVIOLET SPECTROMETERS
Measuring technique of volatile hydrocarbons: Subproject: process spectrometry based on dynamical derivative technique. Status report, 20:1664 (I;DE;In German)
UNCORRELATED-JET MODEL
See JET MODEL
UNDERGROUND DISPOSAL
Addendum to the remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 ponds, boneyard/burnyard, oil landfarm, sanitary landfill I, and the burial grounds, including oil retention ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. main text, 20:242 (R;US)
Buried waste integrated demonstration Fiscal Year 1993 closeout report, 20:266 (R;US)
Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)
Test plan for FY-94 digface characterization field experiments, 20:270 (R;US)
UNDERGROUND EXPLOSIONS
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 1, 20:1690 (R;US)
Proceedings of the seventh symposium on containment of underground nuclear explosions: Volume 2, 20:1691 (R;US)
UNDERGROUND FACILITIES
See also TUNNELS
WIPP
Advances in technology for the construction of deep-underground facilities, 20:1677 (R;US)
UNDERGROUND MINING
Joint project 'Mining': Transport and assembly aids underground: Final report, 20:74 (I;DE;In German)
UNDERGROUND STORAGE
Electromagnetic scattering from buried objects, 20:1685 (R;US)

Tank farm instrumentation and data acquisition/management upgrade plan, 20:424 (R;US)

UNDERWATER EXPLOSIONS
Historical sketches of Sandia National Laboratories nuclear field testing: Volume 1: Full discussion except for sensitive references, 20:1695 (R;US)

UNDULATORS
See WIGGLER MAGNETS

UNICRACKING/HDS PROCESS
See DESULFURIZATION

UNIFIED GAUGE MODELS
See also GRAND UNIFIED THEORY
STANDARD MODEL
WEINBERG LEPTON MODEL
A partial unification model in non-commutative geometry, 20:2099 (R;AU)

UNION OF SOVIET SOCIALIST REPUBLICS
See USSR

UNIPOLAR TRANSISTORS
See FIELD EFFECT TRANSISTORS

UNITED ARAB REPUBLIC
See EGYPTIAN ARAB REPUBLIC

UNITED KINGDOM
A RWMAC commentary on the Science Policy Research Unit report: UK nuclear decommissioning policy: time for decision, 20:808 (I;GB)
Monitoring programme: Radioactive substances report for 1992, 20:1916 (I;GB)
The UK programme and experience on training and qualification for nuclear power plant personnel, 20:2485 (RA;XA)

UNITED STATES OF AMERICA
See USA

UNIVERSE
Regge in the sky: Origin of the cosmic rotation, 20:1982 (R;XA)

UNIVERSITIES
See EDUCATIONAL FACILITIES

UNIVERSITY OF CALIFORNIA LAWRENCE RADIATION LABORATORY
See LAWRENCE BERKELEY LABORATORY

UPSILON-10000 RESONANCES
See UPSILON-10023 MESONS

UPSILON-10023 MESONS
A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S), 20:2146 (R;DE)

UPSILON-10500 RESONANCES
See UPSILON-10575 MESONS

UPSILON-10575 MESONS
A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S), 20:2146 (R;DE)

UPSILON-9460 MESONS
A measurement of the electronic widths Γ_{ee} of the Y(1S), Y(2S), and Y(4S) resonances, and of the total decay width $\Gamma$of the Y(4S), 20:2146 (R;DE)

UPSILON-9500 RESONANCES
See UPSILON-9460 MESONS

URANIUM
See also ENRICHED URANIUM
Advanced pyrochemical technologies for minimizing nuclear waste, 20:321 (R;US)
An improved method for determination of uranium isotopic composition in urine by alpha spectrometry, 20:1300 (I;BR)
Baseline risk assessment of ground water contamination at the inactive uraniferous lignite ashing site near Belfield, North Dakota, 20:488 (R;US)
Extraction of U, Th and gross gamma fission products by irradiated (HTTA-TBP) mixtures, 20:1377 (R;EG)
Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)
Laboratory evaluation of the hydrogen sulfide gas treatment approach for remediation of chromate-, uranium(VI)-, and nitrate-contaminated soils, 20:517 (R;US)
Model of electronic energy relaxation in the test-particle Monte Carlo method, 20:148 (R;FR)
Radiolysis of tri-n-butyl phosphate solutions effect of absorbed dose on extractability of uranium fission products and nitric acid, 20:159 (R;EG)
Response to the independent technical review of the UMTRA Project procedures and practices for well drilling and development, 20:487 (R;US)
Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants: Quarterly technical progress report, April 1, 1994–June 30, 1994, 20:1787 (R;US)
Technical basis for beta skin dose calculations at the Y-12 Plant, 20:1947 (R;US)
The ignitability potential of uranium "roaster oxide", 20:312 (R;US)
Uranium geochemistry in soil and groundwater at the F and H seepage basins, 20:271 (R;US)
Work plan for ground water elevation data recorder/monitor well injection at Grand Junction, Colorado, 20:490 (R;US)
Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado: Revision 1, 20:492 (R;US)
Work plan for ground water elevation data recorder/monitor well installation at Gunnison, Colorado, 20:491 (R;US)

URANIUM 235 TARGET
Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994, 20:2276 (R;US)

URANIUM 238
Supplementary radiological and beryllium characterization of the facility at 425 Peek Street, Schenectady, New York, 20:1825 (R;US)

URANIUM 238 TARGET
Beta and gamma decay heat measurements between 0.1s-50,000s for neutron fission of ^{235}U, ^{238}U and ^{239}Pu: Progress report, March 1, 1993–January 31, 1994, 20:2276 (R;US)

URANIUM ALLOYS
Summary of irradiation data on U-Al and Li-Al alloys, 20:153 (R;US)
Tungsten-uranium penetrator target interaction, 20:1156 (R;US)

URANIUM COMPOUNDS
See also URANIUM SILICIDES
Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report, 20:1362 (I;DE;In German)

URANIUM CONCENTRATES
Uranium in the southern Sao Francisco Craton and marginal belts, 20:143 (I;BR)

URANIUM ISOTOPES
See also URANIUM 238
Nuclear data review and compilation for ATW systems, 20:2267 (R;US)

URANIUM MILLS
See FEED MATERIALS PLANTS

URANIUM MINES
Analysis of population and workers exposure in the context of decommissioning of Wismut uranium mining operations and clean up of wastes, 20:486 (RA;US)
Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Economics, funding and the influence of politics on the Wismut Program, 20:907 (RA;US)
Groundwater restoration of uranium ISL mines in the United States, 20:480 (RA;US)
History of US uranium mining and milling, 20:940 (RA;US)
Principles of radiation protection and legal basis for workers and public protection - a description of the Federal Radiation Survey, 20:1910 (RA;US)

URANIUM ORES
See also URANIUM CONCENTRATES
Alligator Rivers Analogue project. Geochemical Data Bases: Final Report - Volume 10, 20:1804 (I;AU)
Alligator Rivers Analogue project. Geochemistry of ^{239}Pu, ^{129}I, ^{99}Tc and ^{36}Cl: Final Report - Volume 15, 20:1805 (I;AU)

Alligator Rivers Analogue project. Weathering and its effects on uranium redistribution: Final Report - Volume 9, 20:1803 (I;AU)
The effect of weathering on the distribution of uranium and associated elements at Koongarra, Northern Territory, Australia, 20:1806 (I;AU)

URANIUM OXIDE FUEL PLANT
See MIXED OXIDE FUEL FABRICATION PLANTS

URANIUM SILICIDES
A mechanistic model for radiation-induced crystallization and amorphization in U_3Si, 20:1169 (R;US)

URANYL COMPLEXES
Uranyl complexes with heterocyclic carboxylic acids: The crystal and molecular structure of uranyl dinicotinate dihydrate, 20:1278 (IA;PL)

URANYL NITRATES
Y-12 Development Organization technical progress report: Part 3 – Metal processing, period ending March 1, 1994, 20:1337 (R;US)

URBAN AREAS
Development of methods for evaluating options for improving the air quality in Santiago, Chile and its environs, 20:1766 (R;US)
The potential for reducing urban air temperatures and energy consumption through vegetative cooling, 20:992 (R;US)

UREA
Reducing nitrogen oxides in exhaust gases by means of urea. Final report, 20:1087 (R;CH;In German)

URINALYSIS
See URINE

URINE
Studies of the physical parameters for the determination of tritium in urine by the liquid scintillation, 20:1635 (R;DZ)

US DOE
See also ANL
BATTELLE PACIFIC NORTHWEST LABORATORIES
BETTIS
BONNEVILLE POWER ADMINISTRATION
FEED MATERIALS PRODUCTION CENTER
HANFORD ENGINEERING DEVELOPMENT LABORATORY
HANFORD RESERVATION
IDAHO NATIONAL ENGINEERING LABORATORY
INHALATION TOXICOLOGY RESEARCH INSTITUTE
LANL
LAWRENCE BERKELEY LABORATORY
LAWRENCE LIVERMORE LABORATORY
MORGANTOWN ENERGY TECHNOLOGY CENTER
NEVADA TEST SITE
ORNL
OAK RIDGE RESERVATION
PADUCAH PLANT
PORTSMOUTH GASEOUS DIFFUSION PLANT
ROCKY FLATS PLANT
SANDIA LABORATORIES
SAVANNAH RIVER PLANT
WIPP
Y-12 PLANT

Accounting
Chief Financial Officer FY 1994, status report and five-year plan, 20:925 (R;US)

Audits
Initial evaluation of the Department of Energy Audit Report Tracking System (DARTS), 20:977 (R;US)

Budgets
Safety and health five-year plan, Fiscal years 1995–1999, 20:2453 (R;US)

Contracts
Listing of awardee names: Active awards as of October 5, 1994, 20:2457 (R;US)

Educational Tools
National Information Infrastructure Education Forum: A summary report, 20:930 (R;US)

Grants
Listing of awardee names: Active awards as of October 5, 1994, 20:2457 (R;US)

Information Dissemination
National Information Infrastructure Education Forum: A summary report, 20:930 (R;US)

Nuclear Facilities
Preparation, review, and approval of implementation plans for nuclear safety requirements, 20:941 (R;US)

Program Management
Chief Financial Officer FY 1994, status report and five-year plan, 20:925 (R;US)
Listing of awardee names: Active awards as of October 5, 1994, 20:2457 (R;US)
Performance indicators for 2nd quarter CY 1994, 20:497 (R;US)

Radioactive Waste Management
Manual for implementing residual radioactive material guidelines using RESRAD, Version 5.0, 20:218 (R;US)
Negotiating equity for management of DOE wastes, 20:226 (R;US)
Risk perception on management of nuclear high-level and transuranic waste storage, 20:311 (R;US)

Research Programs
Performance measurement process, guidance document, 20:928 (R;US)

Research Reactors
Guidance for the design and management of a maintenance plan to assure safety and improve the predictability of a DOE nuclear irradiation facility: Final report, 20:882 (R;US)

Safeguards
Lawrence Livermore National Laboratory safeguards and security quarterly progress report to the U.S. Department of Energy: Quarter ending June 30, 1994, 20:562 (R;US)

Security
Lawrence Livermore National Laboratory safeguards and security quarterly progress report to the U.S. Department of Energy: Quarter ending June 30, 1994, 20:562 (R;US)

Standards
Department of Energy standards index, 20:2459 (R;US)

Standards Document
Preparation, review, and approval of implementation plans for nuclear safety requirements, 20:941 (R;US)

Technology Transfer
HPCC technology awareness program: Improved economic competitiveness through technology awareness, transfer and application: Final report, 20:2536 (R;US)
Recent National Solar Thermal Test Facility activities, in partnership with industry, 20:702 (R;US)
The U.S. Department of Energy's role in commercialization of solar thermal electric technology, 20:701 (R;US)
The United States Department of Energy Office of Industrial Technology's Technology Benefits Recording System, 20:931 (R;US)
Using Process Quality Management Improvement (PQMI) to develop business processes and procedures, 20:935 (R;US)

US DOE PROGRAM MANAGEMENT
See PROGRAM MANAGEMENT

US FWS
U.S. Fish and Wildlife Service lands biomonitoring operations manual, 20:1793 (R;US)

US NATIONAL ENVIRONMENTAL POLICY ACT
Hanford Site National Environmental Policy Act (NEPA) characterization: Revision 6, 20:579 (R;US)
The UMTRA Project process and framework for execution, 20:481 (RA;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 1, 20:241 (R;US)
US Department of Energy Nevada Operations Office annual site environmental report: 1993: Volume 2: Appendices, 20:453 (R;US)

US NRC
Indexes to Nuclear Regulatory Commission Issuances, January–June 1994, 20:794 (R;US)

Nuclear Regulatory Commission issuances: August 1994: Volume 40, Number 2, 20:750 (R;US)
The Uranium Mill Tailings Radiation Control Act and its implementation from a regulatory perspective, 20:483 (RA;US)

US RESOURCE RECOVERY ACTS
See RESOURCE RECOVERY ACTS

US SUPERFUND
CERCLA site assessment workbook, 20:914 (R;US)
CERCLA site assessment workbook, Volume 1, 20:233 (R;US)
RCRA corrective action & CERCLA remedial action reference guide, 20:913 (R;US)

USA
See also ALASKA
ARIZONA
IDAHO
ILLINOIS
KANSAS
KENTUCKY
LOUISIANA
MISSOURI
NEW MEXICO
NEW YORK
OKLAHOMA
TEXAS
WEST VIRGINIA
WYOMING
Commercial fertilizers 1993, 20:1052 (R;US)
Contrasts between the environmental restoration challenges posed by uranium mining and milling in the United States and the former German Democratic Republic, 20:975 (RA;US)
Economics, funding and the influence of politics on the UMTRA Project, 20:908 (RA;US)
Outline of an on-site inspection regime for conventional arms control in Europe, 20:1679 (R;US)
Present status of petroleum substitution energy (USA), 20:1089 (R;JP;In Japanese)
Summary data 1992, 20:1051 (R;US)
The US DOE Environmental Restoration Program – a Washington perspective, 20:976 (RA;US)
Training for the qualification and competence of nuclear power plant personnel in the United States, 20:2486 (RA;XA)

USSR
Nuclear power in Russia. Status and development trends, 20:966 (IA;PL)
Uranium deposits and production in Eastern Europe and the former Soviet Union, 20:142 (RA;US)

V

V CODES
VAXNEWS version 3.12: Management manual, 20:2549 (R;FR)
VAXNEWS version 3.12: User manual, 20:2548 (R;FR)

VALENCE ELECTRONS
See ELECTRONS

VALVES
See also RELIEF VALVES
200 Area weekly report, 20:165 (R;US)
BCE selector valves and flow proportional sampler, 20:1658 (R;US)
Experience based reliability centered maintenance: An application on motor operated valve drives, 20:753 (R;FI)

VANADIUM
Memory switching and quantum effects in amorphous hydrogenated silicon, 20:2353 (IA;AU)

VANADIUM ALLOYS
See also VANADIUM BASE ALLOYS
Assessment of vanadium alloys for ITER application, 20:1113 (R;NL)
Thermal expansion of V_3 Si with controlled martensite-phase morphology, 20:1130 (IA;AU)
Tribology and surface mechanical properties of excimer laser nitrided titanium, 20:1158 (R;US)

VANADIUM BASE ALLOYS
Properties of V-4Cr-4Ti for application as fusion reactor structural components, 20:1100 (R;US)

VANADIUM NITRIDES
Deposition and properties of novel nitride superlattice coatings: Progress report, 28 September 1990–October 1994, 20:1247 (R;US)

VANADIUM OXIDES
Interaction of vanadium pentoxide with H-ZSM-5 zeolite investigated by EPR, 20:1357 (IA;PL)

VANADIUM SILICIDES
Magnetization studies of superconducting V_3 Si, 20:2371 (IA;AU)

VAPORIZATION
See EVAPORATION

VAX COMPUTERS
See DEC COMPUTERS

VECTOR FIELDS
Visualizing 3D velocity fields near contour surfaces: Revision 1, 20:2561 (R;US)

VECTOR MESONS
See also D*-2010 MESONS
J PSI-3097 MESONS
RHO-770 MESONS
UPSILON-10023 MESONS
UPSILON-10575 MESONS
UPSILON-9460 MESONS
Effective Lagrangian with vector mesons: Linear response theory, 20:2164 (R;FR)
Nuclear A dependence of exclusive vector meson production in muon scattering, 20:2237 (R;US)
Vector meson production at CERN, 20:2247 (R;FR)

VEGETABLE OILS
Method for the transfer of genes in winter rape to plant breeders praxis: Final report, 20:617 (I;DE;In German)
Results of the Baden-Wuerttemberg cultivation experiments with sunflowers, soybeans and flax plants, 1992, 20:619 (I;DE;In German)
Surface Inspection using fourier transform infrared spectroscopy, 20:1338 (R;US)

VEGETATION
See PLANTS

VEHICLES
See also AUTOMOBILES
ELECTRIC-POWERED VEHICLES
MOTORCYCLES
SPACE VEHICLES
TRUCKS
Conceptual design of an RTG Facility Transportation System, 20:1002 (R;US)

VENTILATION DUCTS
See DUCTS

VENTILATION SYSTEMS
Seismic qualification of ventilation stack, 20:1453 (R;US)

VESSELS
See CONTAINERS

VESSELS (CHEMICAL REACTIONS)
See CHEMICAL REACTORS

VESSELS (PRESSURE)
See PRESSURE VESSELS

VIBRATIONS (MECHANICAL)
See MECHANICAL VIBRATIONS

VICTORIA
Brown coal liquefaction project.: Technical summary, 20:42 (I;JP;In Japanese)
Development of brown coal liquefaction technology. 2.: Economical performance investigation on the brown coal liquefaction process, 20:43 (I;JP;In Japanese)

VISCOSIMETERS
Software quality assurance plan for viscometer, 20:407 (R;US)

VOC
See ORGANIC COMPOUNDS
VOLATILE MATTER

VOCATIONAL TRAINING
See TRAINING

VOLATILE MATTER
Characterization of void volume VOC concentration in vented TRU waste drums - an interim report, 20:261 (R;US)
Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data, 20:256 (R;US)
Volatiles combustion in fluidized beds: Technical progress report, 4 June 1994–3 September 1994, 20:1423 (R;US)
VOLATILIZATION
See EVAPORATION
VOLCANISM
Northern hemispheric response to large volcanic eruptions in relation to El Nino - winter case studies, 20:1724 (RA;US)
VOLTAIC CELLS
See ELECTRIC BATTERIES
VORTEX FLOW
An EPV view of the zonal mean distribution of temperature and wind in the extra-tropical troposphere, 20:1736 (RA;US)
Maintenance of extratropical low-frequency variabilities in the atmosphere, 20:1737 (RA;US)
Potential vorticity dynamics for global scale circulations, 20:1727 (RA;US)
Potential vorticity dynamics in the Canadian Climate Centre GCM, 20:1725 (RA;US)
Scaling of saturation amplitudes in baroclinic instability, 20:1734 (RA;US)
Transient eddy feedback and low-frequency variability, 20:1732 (RA;US)
Wave-mean flow interaction and the baroclinic adjustment hypothesis, 20:1728 (RA;US)
VORTICES (MAGNETIC)
See MAGNETIC FLUX
VULCANIZATION
The effect of proteins on the aging properties of radiation vulcanized natural rubber latex, 20:1381 (I;PH)

W

W PLUS BOSONS
Unbinned maximum likelihood fit for the CP conserving couplings for W + photon production at CDF, 20:2030 (R;US)
WAGON WHEEL EVENT
See NUCLEAR EXPLOSIONS
WAKEFIELD ACCELERATORS
Preformed transient gas channels for laser wakefield particle acceleration, 20:1522 (R;US)
WALECKA MODEL
Nuclear matter equation of state with effects of excluded volume., 20:2218 (R;UA)
WASTE BURIAL
See UNDERGROUND DISPOSAL
WASTE CHEMICALS
See CHEMICAL WASTES
WASTE DISPOSAL
See also RADIOACTIVE WASTE DISPOSAL
SANITARY LANDFILLS
UNDERGROUND DISPOSAL
300 Area treated effluent disposal facility operating specifications document, 20:1860 (R;US)
Environmental assessment for the transportation and disposal of Savannah River Site generated municipal solid waste at an off-site disposal facility, 20:231 (R;US)
WASTE FORMS
A comparison of real-time radiography results and visual characterization results with emphasis on WIPP WAC and TRAMPAC compliance issues, 20:255 (R;US)
Characterization of the back-end wastes in view of their transportation, 20:273 (IA;JP)
Gamma irradiation test report of simulated grout specimens for gas generation/liquid advection, 20:410 (R;US)
Laboratory scale vitrification of low-level radioactive nitrate salts and soils from the Idaho National Engineering Laboratory, 20:262 (R;US)
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)
Method of characterizing VOC concentration in vented waste drums with multiple layers of confinement using limited sampling data, 20:256 (R;US)
Methodologies for estimating one-time hazardous waste generation for capacity generation for capacity assurance planning, 20:1826 (R;US)
Proposed waste form performance criteria and testing methods for low-level mixed waste, 20:240 (R;US)
Waste Receiving and Processing Module 2A waste certification strategy, 20:361 (R;US)
WASTE HEAT
Research on the power generation system with thermoelectric conversion elements, 20:1003 (R;JP;In Japanese)
WASTE HEAT UTILIZATION
Feasibility study of power generation system with shape memory alloys, 20:1159 (R;JP;In Japanese)
Possibility of introducing heat storage technologies to Hokkaido, 20:894 (R;JP;In Japanese)
WASTE ISOLATION PILOT PLANT
See WIPP
WASTE MANAGEMENT
See also RADIOACTIVE WASTE MANAGEMENT
WASTE DISPOSAL
WASTE RETRIEVAL
WASTE STORAGE
WASTE TRANSPORTATION
Environmental Hazards Assessment Program: Quarterly report, July 1994–September 1994, 20:916 (R;US)
Industrial waste needs assessment: Phase 1, 20:1054 (R;US)
RCRA corrective action & CERCLA remedial action reference guide, 20:913 (R;US)
Special issue review of pollution prevention management within the Department of Energy, final report, 20:915 (R;US)
WASTE PROCESSING PLANTS
1994 Panel 1 Utilization Plan, 20:252 (R;US)
Facility effluent monitoring plan for the B plant, 20:324 (R;US)
Sampling and analysis plan for ORNL filter press cake waste from the Liquid and Gaseous Waste Operations Department, 20:294 (R;US)
The use of flow zytometry for microbiological analysis and assessing the performance of aerobic and anaerobic sewage works with the aim of biological process optimisation and control: Final report, 20:621 (R;DE;In German)
WASTE PRODUCT UTILIZATION
See also WASTE HEAT UTILIZATION
Survey of 1993 coal production/utilization technology promotion subsidy area models.: Area model survey as measures for environmental load reduction (interim report), 20:1047 (R;JP;In Japanese)
Wastes and by-products - alternatives for agricultural use, 20:1035 (R;US)
WASTE RETRIEVAL
Test plan for FY-94 digface characterization field experiments, 20:270 (R;US)
WASTE SOLUTIONS
See LIQUID WASTES
WASTE STORAGE
See also RADIOACTIVE WASTE STORAGE
Final environmental assessment and Finding-of-No-Significant-Impact - drum storage facility for interim storage of materials generated by environmental restoration operations, 20:232 (R;US)
WASTE TRANSPORTATION
MELTER: A model of the thermal response of cargos transported in the Safe-Secure Trailer subject to fire environments for risk assessment applications, 20:208 (R;US)
WASTE WATER
Evaluation of the Brinecell® electrochemical oxidation unit for destruction of noncyanide strippers and other colored compounds in wastewaters, 20:1042 (R;US)
Magnetic separation for environmental remediation, 20:503 (R;US)

Wastewaters at SRS where heavy metals are a potential problem, 20:443 (R;US)

WASTEFORMS
See WASTE FORMS

WASTES
See also CHEMICAL WASTES
GASEOUS WASTES
INDUSTRIAL WASTES
LIQUID WASTES
MUNICIPAL WASTES
RADIOACTIVE WASTES
SEWAGE
SOLID WASTES
WASTE HEAT

Conceptual study of model introduced to utilize wastes as energy in Hokkaido, 20:1048 (R;JP;In Japanese)
Pollution prevention: Avoiding the need to manage wastes, 20:1053 (R;US)
Recovery of phosphates from elemental phosphorus bearing wastes, 20:1036 (R;US)

WATER
See also DRINKING WATER
GROUND WATER
HEAVY WATER
WASTE WATER

Liquid chromatographic method for determination of water in soils and the optimization of anion separations by capillary zone electrophoresis, 20:1329 (R;US)

WATER COOLANT
See WATER

WATER COOLED REACTORS
See also BWR TYPE REACTORS
NSRR REACTOR
OSIRIS REACTOR
PWR TYPE REACTORS

Analysis of afterheat removal from modular HTGRs during accidents, and a concept for use of spherical fuel elements in LWRs, 20:782 (RA;XA)
Heavy-Section Steel Irradiation Program: Volume 2, No. 2: Semiannual progress report, April–September 1991, 20:1160 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 19: Main report and appendices A–D, 20:875 (R;US)
Precursors to potential severe core damage accidents: 1993, A status report: Volume 20: Appendices E and F, 20:876 (R;US)
RELAP5/MOD3 code manual: Volume 6: Validation of numerical techniques in RELAP5/MOD3, 20:877 (R;US)
Spent fuel storage requirements 1993–2040, 20:191 (R;US)
The role of grain boundary chemistry and structure in the environmentally-assisted intergranular cracking of nickel-base alloys: Progress report, August 1, 1993–July 31, 1994, 20:1109 (R;US)

WATER MODERATOR
See WATER

WATER POLLUTION CONTROL
Groundwater remediation at UMTRA Sites, 20:485 (RA;US)
Use of engineered soils and other site modifications for low-level radioactive waste disposal, 20:1786 (R;US)

WATER POLLUTION MONITORS
Designing an enhanced groundwater sample collection system, 20:1831 (R;US)
Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL, 20:493 (R;US)

WATER QUALITY
Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:462 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:464 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:461 (R;US)
Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:463 (R;US)
Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:465 (R;US)
Straddle-packer determination of the vertical distribution of hydraulic properties in the Snake River Plain Aquifer at well USGS-44, Idaho Chemical Processing Plant, INEL, 20:493 (R;US)

WATER RESERVOIRS
A mathematical model of the temperature and current distributions in a deep stratified reservoir, 20:633 (R;US)

WATER SPRINGS
Seeps and springs sampling and analysis plan for the environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:465 (R;US)

WATER TREATMENT PLANTS
Case studies of sewage treatment with recovery of energy from methane, 20:626 (R;US)

WATER UTILITIES
Annual report 1993 of the German Gas and Water Supply Acco-ciation (DVGW), 20:983 (I;DE;In German)

WATER VAPOR
Continuously-tunable, narrow-linewidth, Q-switched Cr:LiSAF laser for lidar applications, 20:1765 (R;US)

WATERBORNE PARTICLES
See PARTICULATES

WATERFLOODING
Improved techniques for fluid diversion in oil recovery: Quarterly technical progress report, July 1, 1994–September 30, 1994, 20:114 (R;US)

WATERSHEDS
See also PICEANCE CREEK BASIN
Solar concentration/destruction of pesticide rinsewater, 20:695 (R;US)

WAVE PROPAGATION
Rossby wave propagation and teleconnections for the Northern Hemisphere summer flow, 20:1713 (RA;US)

WAVEGUIDES
Application of time-domain reflectometry to monitoring conditions in crushed tuff test plots at Los Alamos, New Mexico: Interpretation and recommendations for landfill monitoring, 20:289 (R;US)
Broad-band, multi-kilowatt, vacuum, HOM waveguide loads for the PEP-II RF cavity, 20:1613 (R;US)
Mode selective directional coupler for NLC, 20:1595 (R;US)
Unlimited-bandwidth distributed optical phase modulators and detectors: Design and fabrication issues, 20:1668 (R;US)

WAVES (SHOCK)
See SHOCK WAVES

WAXES
Low severity upgrading of F-T waxes with solid superacids: Quarterly report, 1 June 1994–31 August 1994, 20:34 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 13: Quarterly technical progress report for second quarter fiscal year 1992 (January 1–March 31, 1992), 20:26 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 30: Quarterly technical status report for second quarter fiscal year 1993 (January 1–March 31, 1993), 20:29 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 24: Quarterly technical progress report for fourth quarter fiscal year 1992 (July 1–September 30, 1992), 20:28 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 33: Quarterly technical status report for third quarter fiscal year 1993 (April 1–June 30, 1993), 20:30 (R;US)

The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 23: Quarterly technical progress report for third quarter fiscal year 1992 (April 1–June 30, 1992), 20:27 (R;US)
The selective catalytic cracking of Fischer-Tropsch liquids to high value transportation fuels: Report number 38: Quarterly technical status report for fourth quarter fiscal year 1993 (July 1–September 30, 1993), 20:31 (R;US)

WAZ 16
See NICKEL BASE ALLOYS

WEAPONS
See also CHEMICAL WARFARE AGENTS
NUCLEAR WEAPONS
Electromagnetic scattering from buried objects, 20:1685 (R;US)
Future directions for arms control and nonproliferation: Conference summary, 20:1097 (R;US)

WEAR
Micro-Raman studies of wear of MG-PSZ, 20:1190 (IA;AU)

WEATHER
Low-frequency anomalies in the NMC MRF model and reality, 20:1718 (RA;US)

WEATHERIZATION
The North Carolina Field Test: Field performance of the preliminary version of an advanced weatherization audit for the Department of Energy's Weatherization Assistance Program, 20:1029 (R;US)

WECS
See WIND TURBINES

WEINBERG ANGLE
Electroweak interference at LEP: Measurements of $A_{FB}{}^{b}$ and $A_{FB}{}^{c}$ at LEP, 20:2177 (R;FR)

WEINBERG LEPTON MODEL
Neutrino mass and oscillation angle phenomena within the asymmetric left-right models, 20:2192 (R;XA)
The BESS model at e^+e^- colliders, 20:2132 (RA;DE)
Valencia 93: The summary of particle theory, 20:2086 (R;XA)

WEINBERG MODEL
See WEINBERG LEPTON MODEL

WELDED JOINTS
Preliminary assessment of the fracture behavior of weld material in full-thickness clad beams, 20:810 (R;US)
Robotic weld overlay coatings for erosion control, 20:90 (R;US)
Unirradiated material properties of Midland weld WF-70, 20:1161 (R;US)

WELDS
See WELDED JOINTS

WELL DRILLING
Response to the independent technical review of the UMTRA Project procedures and practices for well drilling and development, 20:487 (R;US)

WELL INJECTION EQUIPMENT
System to inject steam and produce oil from the same wellbore through downhole valve switching: Final report, 20:119 (R;US)

WELLS
See also EXPLORATORY WELLS
NATURAL GAS WELLS
OIL WELLS
F-Area Acid/Caustic Basin groundwater monitoring report: Second quarter 1994, 20:440 (R;US)
Groundwater quality monitoring well installation for Upper Waste Areas Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:462 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 17 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:464 (R;US)
Groundwater quality monitoring well installation for Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:461 (R;US)
Groundwater quality monitoring well installation for Waste Area Groupings 8 and 9 at Oak Ridge National Laboratory, Oak Ridge, Tennessee, 20:463 (R;US)
Nationwide rural well water survey: The quality of household water and factors influencing it, 20:1842 (R;FI;In Finnish)

WEST GERMANY
See FEDERAL REPUBLIC OF GERMANY

WEST INDIES
Energy profiles of selected Latin American and Caribbean countries: Report series No. 2, 20:974 (R;US)
Regional overview of Latin American and Caribbean energy production, consumption, and future growth: Report series No. 1, 20:973 (R;US)

WEST VIRGINIA
A novel geotechnical/geostatistical approach for exploration and production of natural gas from multiple geologic strata: Technical progress report, April–June, 1994, 20:131 (R;US)

WESTERN REGION
See USA

WESTVACO PROCESS
See DESULFURIZATION

WHOLESALE PRICES
Weekly petroleum status report: Data for week ended, October 21, 1994, 20:100 (R;US)
Winter fuels report, 20:102 (R;US)
Winter fuels report: Week ending, October 21, 1994, 20:103 (R;US)

WIGGLER MAGNETS
A multiple objective magnet sorting algorithm for the ALS insertion devices, 20:1604 (R;US)
Advanced Light Source elliptical wiggler, 20:1605 (R;US)
Undulators at the ALS, 20:1590 (R;US)

WILD ANIMALS
Historical records of radioactive contamination in biota at the 200 Areas of the Hanford Site, 20:469 (R;US)
Lower Yakima Valley Wetlands and Riparian Restoration Project: Final environmental assessment, 20:638 (R;US)

WILPUTTE PROCESS
See COAL GASIFICATION

WIND
Modelling the day to day wind variability offshore central Chile at about 30 deg. south, 20:718 (R;XA)

WIND ENERGY CONVERSION SYSTEMS
See WIND TURBINES

WIND GENERATORS
See ELECTRIC GENERATORS
WIND TURBINES

WIND POWER PLANTS
14th Annual international meeting of wind turbine test stations: Proceedings, 20:724 (R;US)
Field testing programme for solar- and wind energy applications in developing countries (REBRA): Final report, 20:999 (I;DE;In German)
German-Chinese cooperation in the field of wind and solar energy: Final report, 20:721 (I;DE;In German)

WIND TURBINES
14th Annual international meeting of wind turbine test stations: Proceedings, 20:724 (R;US)
Choice, examination and test of small wind power stations for developing countries: Final report about the test in Kaiser-Wilhelm-Koog, 20:720 (R;DE;In German)
Investigation of different rotor blade forms of wind power plants by means of quasi-steady wind tunnel tests, 20:722 (R;DE;In German)

WINDOWS
A new method for predicting the solar heat gain of complex fenestration systems: II, Detailed description of the matrix layer calculation, 20:1022 (R;US)

WINDSCALE REPROCESSING PLANT
See SELLAFIELD REPROCESSING PLANT

WIPP
Environmental Protection implementation plan for the Waste Isolation Pilot Plant, November 9, 1994, to November 9, 1995, 20:251 (R;US)
Performance-based waste acceptance criteria preliminary baseline assumptions, 20:229 (R;US)
WIPP facility representative program plan, 20:250 (R;US)
Westinghouse Hanford Company plan for certifying newly generated contact-handled transuranic waste, 20:429 (R;US)

WOLFRAM
See TUNGSTEN
WOOD
Utilization of straw- and wood pellets for fuelling of small heating systems, 20:628 (R;DK;In Danish)
WOOD FUELS
Jointly sponsored research program: Quarterly technical progress report, April–June, 1994, 20:927 (R;US)
WORKERS
See PERSONNEL
WORKING (MATERIALS)
See MATERIALS WORKING
WWER TYPE REACTORS
See also LOVIISA-1 REACTOR
LOVIISA-2 REACTOR
Seismic design and analysis methods, 20:764 (R;FI;In Finnish)
Validation of the reactor dynamics code HEXTRAN, 20:767 (R;FI)
WYOMING
An evaluation of known remaining oil resources in the state of New Mexico and Wyoming: Volume 4, Project on Advanced Oil Recovery and the States, 20:109 (R;US)

X

X RADIATION
Calcium antagonist, TMB-8, prevents the induction of adaptive response by hydrogen peroxide in human lymphocytes, 20:1919 (IA;PL)
X-RASERS
See X-RAY LASERS
X-RAY DIFFRACTION
Polarization effects on the electron density of lone pairs, 20:2305 (IA;PL)
The wide-range X-ray scattering of structural changes in PETP occurring under heavy ions irradiation, 20:2357 (IA;PL)
X-RAY DIFFRACTOMETERS
Chemical bonding and covalency in $NiSO_4 \cdot 6H_2O$ by measurement of charge and spin densities, 20:2339 (IA;PL)
Reciprocal space mapping of epitaxial materials using position-sensitive x-ray detection, 20:1673 (R;US)
X-RAY FLUORESCENCE ANALYSIS
An attempt of determination of heavy metals content in environmental samples by low resolution XRF technique, 20:1316 (IA;PL)
X-RAY LASERS
Molecular design concept for multi-kilovolt x-ray amplification: Final report, December 13, 1990–December 14, 1993, 20:2279 (R;US)
Observation of strong emission from NeIX and NeX transitions in a laser-driven plasma, 20:1510 (R;US)
X-RAY RADIOGRAPHY
A cryogenic dose calorimeter for pulsed radiographic accelerators, 20:1651 (R;US)
Nondestructive examination development and demonstration plan, 20:355 (R;US)
XENON
Studies of selenium and xenon in inductively coupled plasma mass spectrometry, 20:1328 (R;US)
X-ray spectroscopy of xenon: Final report, 20:2281 (R;US)
XENON 129 REACTIONS
Heavy residues from very mass asymmetric heavy ion reactions, 20:2268 (R;US)

Y

Y-12 PLANT
Addendum to the remedial investigation work plan for Bear Creek Valley Operable Unit 1 (S-3 ponds, boneyard/burnyard, oil landfarm, sanitary landfill I, and the burial grounds, including oil retention ponds 1 and 2) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. main text, 20:242 (R;US)
Closure certification report for the Bear Creek burial grounds B area and walk-in pits at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, 20:444 (R;US)
Comprehensive monitoring report for underground storage tank 2331-U at Building 9201-1, 20:478 (R;US)
Remedial Investigation Report on Chestnut Ridge Operable Unit 2 (Filled Coal Ash Pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 1. Main Text, 20:735 (R;US)
Remedial investigation report on Bear Creek Valley Operable Unit 2 (rust spoil area, spoil area 1, and SY-200 yard) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2. Appendixes, 20:495 (R;US)
Remedial investigation report on Chestnut Ridge Operable Unit 2 (filled coal ash pond/Upper McCoy Branch) at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee: Volume 2: Appendixes, 20:494 (R;US)
Resource Conservation and Recovery Act (RCRA) Part B Permit Application for Production Associated Units at the Oak Ridge Y-12 Plant, 20:446 (R;US)
Resource Conservation and Recovery Act (RCRA) contingency plan for hazardous waste treatment, storage, and disposal units at the Oak Ridge Y-12 Plant, 20:546 (R;US)
Site-specific standard request for Underground Storage Tanks 1219-U, 1222-U, 2082-U, and 2068-U at the Rust Garage Facility Buildings 9754-1 and 9720-15, 20:545 (R;US)
The February 21, 1993 tornadoes of East Tennessee, 20:544 (R;US)
The Y-12 Plant - a model for environmental excellence, 20:939 (R;US)
YANKEE EVENT
See NUCLEAR EXPLOSIONS
YTTRIUM ALUMINIUM GARNETS
See ALUMINIUM OXIDES
FERRITE GARNETS
YTTRIUM COMPOUNDS
YTTRIUM COMPLEXES
Investigation of structures and properties of new materials from amino triazole complexes of transition metals, 20:1361 (IA;PL)
YTTRIUM COMPOUNDS
See also YTTRIUM FLUORIDES
YTTRIUM OXIDES
Determination of ^{90}Sr in grass and soil, 20:1335 (R;CH)
YTTRIUM FLUORIDES
Accumulated photon echoes in Nd^{3+}-doped CaF_2 and disordered CaF_2-YF_3 crystals, 20:2332 (IA;AU)
YTTRIUM OXIDES
Compactification
A Shock-Hugoniot for $YBa_2 Cu_3 O_7$ powder, 20:1184 (IA;AU)
Electric Conductivity
Study of Electrophysical properties of $Y Ba_2 Cu_3 O_{7-\delta}$: $Y_2 Ba Cu O_5$ and $Y Ba_2 Cu_3 O_{7-\delta}$: $Ba Cu O_2$ composites., 20:1228 (IA;UA;In Russian)
Variable range hopping conductivity in $Y_1 23$:$Y_2 11$ composites close to the percolation limit, 20:1202 (IA;AU)
Gold Additions
^{197}Au Moessbauer analysis of gold-doped YBCO, 20:2337 (IA;AU)
Hall Effect
Hall effect in Zn-doped Y-124, 20:1201 (IA;AU)
Hyperfine Structure
Oxygen stoichiometry measurements in polycrystalline $YBa_2 Cu_3 O_{7-x}$ by Micro-Raman spectroscopy, 20:2336 (IA;AU)
Magnetic Fields
Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Microstructure
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Moessbauer Effect
^{197}Au Moessbauer analysis of gold-doped YBCO, 20:2337 (IA;AU)

Phase Studies
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Sample Preparation
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
About influence of silver additions on superconducting properties of the HTSC ceramic, 20:1226 (IA;UA;In Russian)
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Shear Properties
Low temperature micro plasticity of yttrium ceramics in weak magnetic fields., 20:1229 (IA;UA;In Russian)
Superconducting Composites
Variable range hopping conductivity in $Y_1 23$:$Y_2 11$ composites close to the percolation limit, 20:1202 (IA;AU)
Superconducting Junctions
About influence of silver additions on superconducting properties of the HTSC ceramic, 20:1226 (IA;UA;In Russian)
Study of Electrophysical properties of Y Ba_2 Cu_3 $O_{7-\delta}$: Y_2 Ba Cu O_5 and Y Ba_2 Cu_3 $O_{7-\delta}$: Ba Cu O_2 composites., 20:1228 (IA;UA;In Russian)
Superconductivity
ARC welding of yttrium ceramics as a method for preparation of initial material for liquid-phase processing., 20:1230 (IA;UA;In Russian)
Microstructure and superconducting properties of the crystallized yttrium ceramics., 20:1223 (IA;UA;In Russian)
Thin Films
YBCO thin film deposition by cathodic arc and laser ablation, 20:1185 (IA;AU)
Zinc Additions
Hall effect in Zn-doped Y-124, 20:1201 (IA;AU)

YUCCA MOUNTAIN
Evaluation of thermo-hydrological performance in support of the thermal loading systems study, 20:320 (R;US)
Site characterization progress report: Yucca Mountain, Nevada, October 1, 1993–March 31, 1994, 20:249 (R;US)
Stiffness and strength properties of natural fractures from north ramp drill holes, 20:467 (R;US)
Test interference calculations for the Yucca Mountain Project ESF thermomechanical experiments: Yucca Mountain Site Characterization Project, 20:314 (R;US)
Yucca Mountain Site Characterization Project: Technical Data Catalog (quarterly supplement), June 30, 1994, 20:248 (R;US)

YUGOSLAVIA
Communication dated 10 March 1994 received from the Permanent Mission of the Federal Republic of Yugoslavia (Serbia and Montenegro), 20:573 (R;XA;In Arabic, Chinese, English, French)

Z

Z NEUTRAL BOSONS
A precision measurement of the branching ratio $\Gamma_{bantlb}/\Gamma_{had}$ in the e^+e^- annihilation on the Z^0 resonance, 20:2180 (R;DE;In German)
A preliminary, precise measurement of the average B hadron lifetime, 20:2181 (R;US)
Precision determination of the Z^o resonance parameters, 20:1655 (R;NO)
Upper limit determination for the τneutrino mass with OPAL detector, 20:2185 (R;DE;In German)

ZENTRALINST. F. KERNFORSCHUNG
See ZFK ROSSENDORF

ZEOLITES
See also ANALCIME
CLINOPTILOLITE
Radiation - induced silver agglomeration in A zeolites, 20:1382 (IA;PL)
Silver-centred radicals in A zeolites, 20:1398 (IA;PL)

ZFK ROSSENDORF
Forschungszentrum Rossendorf, Institut fuer Ionenstrahlphysik und Materialforschung. Annual report 1993, 20:2313 (R;DE)

ZHURAVLEV PROCESS
See COAL GASIFICATION

ZINC
Experimental and numerical investigation of shock-induced full vaporization of zinc, 20:1681 (R;US)
Improved die castings through plasma surface modification, improved sensors and die soldering prevention: Quarterly progress report 1, July 1–September 30, 1994, 20:1112 (R;US)

ZINC BASE ALLOYS
An investigation of preferential sputtering from single-phase α- and β- Cu/Zn alloys, 20:1122 (IA;AU)

ZINC COMPOUNDS
See also ZINC SELENIDES
Application of biosorption and accumulation processes for metal separation and recovery from polluted industrial effluents for the purpose of environmental pollution abatement: Final report, 20:1362 (I;DE;In German)
Enviropower hot gas desulfurization pilot, 20:7 (R;US)

ZINC DISTILLATION PROCESS
See PYROCHEMICAL REPROCESSING

ZINC HALIDE PROCESS
See COAL LIQUEFACTION

ZINC SELENIDES
Photoluminescence under pressure and annealing of nitrogen-doped ZnSe, 20:1283 (R;US)

ZINC-AIR BATTERIES
Zinc/air technology, December 1993 meeting report, 20:900 (R;US)

ZIRCALOY 4
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and Inconel-718 at high temperatures, 20:1150 (R;DE)
Chemical interactions between as-received and pre-oxidized Zircaloy-4 and stainless steel at high temperatures, 20:1151 (R;DE)

ZIRCON
Mechanochemically induced reduction of zircon sand, 20:1214 (IA;AU)

ZIRCONIUM
Corrosion resistance and behavioral characteristics of metals exposed to 70 percent by weight sulfuric acid at elevated temperatures, 20:1167 (R;US)
Zirconium X-ray emission spectra by an electron probe micro analyser, 20:2286 (IA;AU)

ZIRCONIUM BASE ALLOYS
Corrosion resistance and behavior of construction materials exposed to dilute sulfuric acid at elevated temperatures under static conditions, 20:1166 (R;US)

ZIRCONIUM OXIDES
Dielectric relaxations in yttria-stabilised zirconia alloys at lower temperatures, 20:1198 (IA;AU)
Directional solidification of the alumina-zirconia ceramic eutectic system, 20:1233 (R;US)
Glassy thermal expansion of cubic stabilised zirconia alloys, 20:1199 (IA;AU)
In-situ capability of ion beam modification and characterization of materials at Los Alamos National Laboratory, 20:1237 (R;US)
Inelastic neutron scattering from cubic stabilised zirconia, 20:2334 (IA;AU)
Mechanochemically induced reduction of zircon sand, 20:1214 (IA;AU)
Micro-Raman studies of wear of MG-PSZ, 20:1190 (IA;AU)
Neutron diffraction measurements of time-dependent transformation of plastically deformed Mg-PSZ, 20:2333 (IA;AU)
Tailoring suspension flow for the gelcasting of oxide and nonoxide ceramics, 20:1172 (R;US)

ZIRCONIUM PHOSPHATES
Low-temperature-setting phosphate ceramics for low-level mixed waste stabilization, 20:219 (R;US)

ZIRCONOLITE
Charge compensation mechanisms for aliovalent impurities in perovskite and zirconolite, 20:1213 (IA;AU)
ZUNI EVENT
See NUCLEAR EXPLOSIONS

Contract Number Index

Numbers assigned to DOE contracts announced in documents in this publication are listed. Contract numbers are sorted alphanumerically and list the primary corporate author of the document cited, the citation number, and the report number or other document identification.

Contract No.	Abstract No.	Report No.
AC01-83NE32112	**General Electric Co., Philadelphia, PA (United States). Astro Space Div.**	
	20:608	DOE/NE/32112–T6
AC01-91RW00134	**TRW, Inc., Fairfax, VA (United States)**	
	20:248	DOE/RW/00134–T14
AC02-76CH00016	**Brookhaven National Lab., Upton, NY (United States)**	
	20:240	DOE/MWIP–30
	20:871	BNL-NUREG–60392
	20:895	BNL–60533
	20:1013	BNL–60930
	20:1340	BNL–60952
	20:1428	BNL–60902
	20:1514	BNL–60093
	20:1515	BNL–60774
	20:1516	BNL–60826
	20:1517	BNL–60827
	20:1527	BNL–52439
	20:1528	BNL–60862
	20:1529	BNL–60876
	20:1530	BNL–60878
	20:1541	BNL–47476
	20:1542	BNL–52424-Rev.9/94
	20:1543	BNL–60553
	20:1544	BNL–60874
	20:1545	BNL–60907
	20:1546	BNL–60926
	20:1616	BNL–60905
	20:1617	BNL–60935
	20:1663	BNL–60892
	20:1872	BNL–60834
	20:2203	BNL–60785
	20:2204	BNL–60796
	20:2205	BNL–60807
	20:2206	BNL–60808
	20:2233	BNL–60809
	20:2234	BNL–60923
	20:2308	BNL–60900
	20:2309	BNL–60903
	20:2310	BNL–60934
	20:2532	BNL–60655
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
	20:878	NUREG/CR–6087
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research	
	20:830	NUREG/CR–6105
	20:831	NUREG/CR–6146
AC02-76CH03000	**Fermi National Accelerator Lab., Batavia, IL (United States)**	
	20:1532	FNAL/C–94/253
	20:1533	FNAL-TM–94/1903
	20:1534	FNAL-TM–1878
	20:1535	FNAL-TM–1896
	20:1548	FNAL/C–94/213
	20:1549	FNAL-TM–1902
	20:1622	FNAL/C–94/281-E
	20:1623	FNAL/C–94/284-E
	20:1624	FNAL/C–94/320-E
	20:1625	FNAL/C–94/340-E
	20:1626	FNAL/C–94/342-E
	20:2150	FNAL/C–94/216-E
	20:2151	FNAL/C–94-274-E
	20:2152	FNAL/C–94/325-E
	20:2153	FNAL/C–94-336-E
	20:2154	FNAL/C–94/341-E
	20:2155	FNAL/C–94/343-E
	20:2156	FNAL/C–94/345-E
	20:2191	FNAL/C–94/314-E
	20:2237	FNAL/C–94/219-E
AC02-76CH03073	**Princeton Univ., NJ (United States). James Forrestal Research Center**	
	20:2423	PPPL-CFP–3167
	Princeton Univ., NJ (United States). Plasma Physics Lab.	
	20:1368	PPPL-CFP–3140
	20:2419	PPPL–2975
	20:2420	PPPL–3010
	20:2421	PPPL–3016
	20:2422	PPPL-CFP–3163
	Los Alamos National Lab., NM (United States)	
	20:2417	LA-UR–94-3666
	20:2444	LA-UR–94-3667
AC02-76ER00038	**Notre Dame Univ., IN (United States). Radiation Lab.**	
	20:1373	DOE/ER/00038–3707
AC02-78ET51013	**Princeton Univ., NJ (United States). James Forrestal Research Center**	
	20:2423	PPPL-CFP–3167
AC02-79ET34013	**ABB/Combustion Engineering, Inc., Windsor, CT (United States)**	
	20:762	DOE/ET/34013–15
AC02-88CE90027	**Burton Technologies, Inc., Raleigh, NC (United States)**	
	20:1242	DOE/CE/15613–T2
AC02-91CE40942	**ERC, Inc., Tullahoma, TN (United States)**	
	20:1040	DOE/CE/40942–3
AC03-76SF00098	**Stanford Linear Accelerator Center, Menlo Park, CA (United States)**	
	20:1609	SLAC-PUB–6533
	20:1610	SLAC-PUB–6539
	20:1612	SLAC-PUB–6548
	20:1614	SLAC-PUB–6553
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
	Lawrence Berkeley Lab., CA (United States)	
	20:896	LBL–35566
	20:897	LBL–35567
	20:898	LBL–35628
	20:921	LBL–27170(1994)
	20:990	LBL–34046
	20:991	LBL–34243
	20:992	LBL–35320
	20:1020	LBL–34123

Contract No.	Abstract No.	Report No.
	20:1021	LBL–34458
	20:1022	LBL–34716
	20:1023	LBL–35240
	20:1024	LBL–35241
	20:1025	LBL–35244
	20:1026	LBL–36134
	20:1032	LBL–35919
	20:1283	LBL–35358
	20:1284	LBL–35433
	20:1365	LBL–35769
	20:1366	LBL–36065
	20:1495	LBL–36312
	20:1523	LBL–35966
	20:1524	LBL–36110
	20:1590	LBL–35844
	20:1591	LBL–35865
	20:1604	LBL–35535
	20:1605	LBL–35843
	20:1606	LBL–36064
	20:1607	LBL-PUB–3123
	20:1890	LBL–35802
	20:2007	LBL–36120
	20:2025	LBL–35929
	20:2178	LBL–36033
	20:2268	LBL–36087
	20:2269	LBL–36103
	20:2270	LBL–36104
	20:2271	LBL–36105
	20:2272	LBL-PUB–5399
	20:2296	LBL–36197
	20:2306	LBL–35940
	20:2397	LBL–36063
	20:2445	LBL–36067
	Lawrence Livermore National Lab., CA (United States)	
	20:1822	LBL–35056
AC03-76SF00515	**Stanford Linear Accelerator Center, Menlo Park, CA (United States)**	
	20:1526	SLAC-PUB–6449
	20:1593	SLAC-PUB–6535
	20:1594	SLAC-PUB–6677
	20:1595	SLAC-PUB–6690
	20:1608	SLAC-PUB–6517
	20:1609	SLAC-PUB–6533
	20:1610	SLAC-PUB–6539
	20:1611	SLAC-PUB–6540
	20:1612	SLAC-PUB–6548
	20:1613	SLAC-PUB–6552
	20:1614	SLAC-PUB–6553
	20:1656	SLAC-PUB–6686
	20:2182	SLAC-PUB–6665
AC03-89ER51114	**Princeton Univ., NJ (United States). James Forrestal Research Center**	
	20:2423	PPPL-CFP–3167
	General Atomics, San Diego, CA (United States)	
	20:2408	GA-A–21778
	20:2555	PATENTS-US–A7950548
AC03-89SF17885	**General Atomics, San Diego, CA (United States)**	
	20:770	GA-A–21720
AC03-91SF18852	**Martin Marietta Astro Space, Philadelphia, PA (United States)**	
	20:609	DOE/SF/18852–T44
AC04-76DP00613	**Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div.**	
	20:556	KCP–613-5425
	20:1046	KCP–613-5496
	20:1149	KCP–613-5435
	20:1500	KCP–613-5388
	20:1501	KCP–613-5432
AC04-76DP00789	**Sandia Labs., Livermore, CA (United States)**	
	20:2538	ESTSC–000188IBMPC00
	Sandia National Labs., Albuquerque, NM (United States)	
	20:2559	SAND–94-8718C
	Sandia National Labs., Livermore, CA (United States)	
	20:1426	SAND–94-8730C
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	20:123	SAND–94-1743
	20:189	DOE/FTR–94008730
	20:208	SAND–93-0737
	20:314	SAND–94-0278
	20:315	SAND–94-0805C
	20:316	SAND–94-2106
	20:317	SAND–94-2380C
	20:318	SAND–94-2759C
	20:467	SAND–94-2339C
	20:513	SAND–94-1237
	20:514	SAND–94-2703C
	20:560	SAND–94-1881C
	20:561	SAND–94-2570C
	20:691	SAND–94-2068
	20:692	SAND–94-2453
	20:694	SAND–94-2498C
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	20:702	SAND–94-2437C
	20:706	SAND–94-1245C
	20:707	SAND–94-1758C
	20:708	SAND–94-2431C
	20:792	SAND–94-2033C
	20:793	SAND–94-2376C
	20:812	SAND–94-0146
	20:883	SAND–94-2400C
	20:899	SAND–94-1398C
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	20:1050	SAND–94-1710
	20:1162	SAND–94-1539C
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	20:1164	SAND–94-2676C
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Contract No.	Abstract No.	Report No.
	20:1288	SAND–94-1607
	20:1424	SAND–94-8244
	20:1425	SAND–94-8409
	20:1444	SAND–93-3909C
	20:1445	SAND–94-1181C
	20:1446	SAND–94-1664
	20:1447	SAND–94-1819
	20:1448	SAND–94-2354C
	20:1477	SAND–94-1173
	20:1504	SAND–93-1531
	20:1505	SAND–94-1302C
	20:1506	SAND–94-1978C
	20:1507	SAND–94-2201C
	20:1508	SAND–94-2469C
	20:1509	SAND–94-2542C
	20:1525	SAND–94-1859C
	20:1592	SAND–94-1911C
	20:1666	SAND–94-0024
	20:1667	SAND–94-1375C
	20:1668	SAND–94-2156C
	20:1669	SAND–94-2572
	20:1673	SAND–94-1071C
	20:1674	SAND–94-2472C
	20:1680	SAND–90-7083
	20:1681	SAND–93-4018C
	20:1682	SAND–93-4074C
	20:1683	SAND–94-1016C
	20:1684	SAND–94-2144C
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	20:1697	SAND–94-2143
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	20:2307	SAND–94-1670C
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	20:884	SAND–94-8724C
	20:936	SAND–94-2581C
	20:1034	SCL-DR–720077
	20:1449	SAND–94-8245
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	20:295	ORNL/TM–12825
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	20:464	ORNL/ER–74
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	20:494	DOE/OR–01-1268/V2-D1
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Contract No.	Abstract No.	Report No.
	20:2552	ORNL/TM–12754
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AC05-84OS21400	**Oak Ridge National Lab., TN (United States)**	
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	20:819	Y/DV–1353
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	20:1461	Y/DW–1341
	20:1489	Y/DW–1332
	Oak Ridge Y-12 Plant, TN (United States)	
	20:444	Y/ER–158
	20:446	Y/TS–838/R3
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	20:298	PNL–10061
	20:299	PNL–10099
	20:300	PNL–10101
	20:301	PNL–10107
	20:302	PNL–10127
	20:303	PNL–10128
	20:304	PNL–10146
	20:305	PNL–10147
	20:306	PNL–10150
	20:307	PNL–10158
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	20:922	PNL-SA–24404
	20:932	PNL–10188
	20:933	PNL-SA–23687
	20:970	PNL–10197
	20:1031	PNL–10125
	20:1333	PNL-SA–23112
	20:1334	PNL-SA–23466
	20:1828	PNL–9963
	20:1829	PNL–10056
	20:1830	PNL–10094
	20:1831	PNL–10182
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Contract No.	Abstract No.	Report No.	Contract No.	Abstract No.	Report No.
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	20:329	WHC-EP–0816		20:397	WHC-SD-WM-ER–387
	20:330	WHC-EP–0823		20:398	WHC-SD-WM-ETP–0106
	20:331	WHC-MR–0480		20:399	WHC-SD-WM-ETP–122
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	20:334	WHC-SA–2559		20:402	WHC-SD-WM-FDC–031
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	20:336	WHC-SD-CP-PLN–026		20:404	WHC-SD-WM-PE–053
	20:337	WHC-SD-CP-QAPP–015		20:405	WHC-SD-WM-PLN–090
	20:338	WHC-SD-CP-TI–193		20:406	WHC-SD-WM-PMP–014
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	20:341	WHC-SD-GN-ISB–30001		20:409	WHC-SD-WM-RD–038-Rev.1
	20:342	WHC-SD-HWV-SDP–004-Rev.1		20:410	WHC-SD-WM-RPT–087
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	20:344	WHC-SD-NR-CSER–013		20:412	WHC-SD-WM-SDD–025
	20:345	WHC-SD-PRP-HA–010		20:413	WHC-SD-WM-TA–158
	20:346	WHC-SD-SNF-ER–003		20:414	WHC-SD-WM-TI–399-Rev.2
	20:347	WHC-SD-SNF-ES–003		20:416	WHC-SD-WM-TI–643
	20:348	WHC-SD-SNF-PLN–001		20:417	WHC-SD-WM-TI–645
	20:349	WHC-SD-SNF-TC–001		20:418	WHC-SD-WM-TI–648
	20:350	WHC-SD-SNF-WP–002		20:419	WHC-SD-WM-TI–661
	20:351	WHC-SD-SQA-CSA–20377		20:420	WHC-SD-WM-TI–664
	20:352	WHC-SD-W026-OCD–001		20:421	WHC-SD-WM-TP–207
	20:353	WHC-SD-W026-TI–006-Rev.1		20:422	WHC-SD-WM-TRP–220
	20:354	WHC-SD-W026-TI–009		20:423	WHC-SD-WM-WP–072-Rev.3
	20:355	WHC-SD-W026-TP–001		20:424	WHC-SD-WM-WP–132-Rev.4
	20:356	WHC-SD-W026-TP–008		20:425	WHC-SD-WM-WP–245-Rev.1
	20:357	WHC-SD-W049H-ATP–001		20:426	WHC-SD-WM-WP–264
	20:358	WHC-SD-W059-ES–002		20:427	WHC-SP–1009-Rev.1
	20:359	WHC-SD-W100-ACDR–001		20:428	WHC-SP–1097
	20:360	WHC-SD-W100-SDRD–001		20:429	WHC-SP–1142
	20:361	WHC-SD-W100-SP–001		20:469	WHC-MR–0418
	20:362	WHC-SD-W100-TP–011		20:470	WHC-SD-SNF-ES–001
	20:363	WHC-SD-W100-TP–014		20:471	WHC-SD-SNF-LB–001
	20:364	WHC-SD-W112-ES–006		20:472	WHC-SD-WM-RPT–093
	20:365	WHC-SD-W236A-ER–011		20:517	WHC-EP–0694
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	20:367	WHC-SD-W306-TI–002		20:519	WHC-EP–0782-Vol.2
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	20:369	WHC-SD-WM-ANAL–033-Vol.2		20:521	WHC-SA–2235
	20:370	WHC-SD-WM-ANAL–034-Vol.1		20:522	WHC-SA–2653
	20:371	WHC-SD-WM-ANAL–034-Vol.2		20:523	WHC-SD-GN-TRP–20024
	20:372	WHC-SD-WM-ATP–023-Rev.5		20:524	WHC-SD-GN-TRP–30011
	20:373	WHC-SD-WM-ATP–082		20:525	WHC-SD-GN-TRP–30018
	20:374	WHC-SD-WM-ATP–100		20:526	WHC-SD-SNF-SARR–002-Rev.1
	20:375	WHC-SD-WM-ATR–044		20:527	WHC-SD-SQA-CSA–20374
	20:376	WHC-SD-WM-ATR–098		20:528	WHC-SD-WM-DQO–011-Rev.1
	20:377	WHC-SD-WM-CSCM–027		20:529	WHC-SD-WM-ES–300
	20:378	WHC-SD-WM-CSRS–016		20:530	WHC-SD-WM-ES–313
	20:379	WHC-SD-WM-DA–157		20:531	WHC-SD-WM-LL–006
	20:380	WHC-SD-WM-DA–163		20:532	WHC-SD-WM-PRS–014
	20:381	WHC-SD-WM-DGS–001		20:533	WHC-SD-WM-SAR–064
	20:382	WHC-SD-WM-DP–071		20:534	WHC-SD-WM-TP–271
	20:383	WHC-SD-WM-DQO–014		20:535	WHC-SP–1105
	20:384	WHC-SD-WM-DTR–036		20:536	WHC-SP–1119
	20:386	WHC-SD-WM-ER–309		20:537	WHC-SP–1122-Vol.4
	20:388	WHC-SD-WM-ER–311		20:538	WHC-SP–1126-Vol.1
	20:390	WHC-SD-WM-ER–313		20:539	WHC-SP–1126-Vol.3
	20:392	WHC-SD-WM-ER–324		20:563	WHC-SD-CP-RPT–014
	20:393	WHC-SD-WM-ER–325		20:564	WHC-SD-SNF-ATP–002
	20:394	WHC-SD-WM-ER–363		20:565	WHC-SD-SNF-ATP–003
	20:395	WHC-SD-WM-ER–364			

Contract No.	Abstract No.	Report No.
	20:566	WHC-SD-SNF-TP–005
	20:869	WHC-EP–0804
	20:870	WHC-SD-FF-SSP–052
	20:886	WHC-SD-FL-ELS–001
	20:937	WHC-SA–2683
	20:938	WHC-SP–1125
	20:996	WHC-SD-LL-RD–004
	20:1005	WHC-SA–2489
	20:1165	WHC-SD-SNF-ER–004
	20:1290	WHC-MR–0479
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	20:1454	WHC-SD-GN-CSWD–30036-Rev.1
	20:1455	WHC-SD-GN-DGS–30011
	20:1456	WHC-SD-GN-SA–30006
	20:1457	WHC-SD-TD-ER–004
	20:1458	WHC-SD-W320-TC–002
	20:1459	WHC-SD-WM-ER–380
	20:1460	WHC-SD-WM-SDD–049
	20:1496	WHC-SD-EN-TRP–007
	20:1657	WHC-SD-SQA-CSWD–30016
	20:1676	WHC-SD-WM-ATP–103
	20:1771	WHC-SD-L070-PMP–001
	20:1843	WHC-SA–1937
	20:1860	WHC-SD-L045H-PC–001
	20:2518	WHC-SP–1106
	20:2519	WHC-SP–1109
	20:2520	WHC-SP–1122-Vol.1
	20:2521	WHC-SP–1122-Vol.2
	20:2522	WHC-SP–1122-Vol.3
	20:2523	WHC-SP–1127
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	20:387	WHC-SD-WM-ER–310
	20:389	WHC-SD-WM-ER–312
	20:391	WHC-SD-WM-ER–323
AC07-76ID01570	**Idaho National Engineering Lab., Idaho Falls, ID (United States)**	
	20:234	DOE/ID–10054(93)
	20:235	DOE/ID–10454
	20:238	DOE/LLW–157-Rev.1
	20:255	EGG-M–94237
	20:260	EGG-WM–11342
	20:261	EGG-WM–11479
	20:263	EGG-WTD–10651
	20:264	EGG-WTD–10981-Vol.1
	20:265	EGG-WTD–10981-Vol.2
	20:266	EGG-WTD–11136
	20:269	EGG-WTD–11185
	20:270	EGG-WTD–11424
	20:456	EGG-PIR–10633(4Q-93)
	20:497	EGG-PIR–10633(2Q-94)
	20:498	EGG-WTD–11156
	20:567	DOE/LLW–206
	20:1749	INEL/MISC–94045
	20:1750	INEL/MISC–94046
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	20:1792	EGG-CIET–11399
	20:1793	EGG-EST–9222-Vol.1
	20:1874	EGG–2738
	EG and G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab.	
	20:1915	EGG-RAAM–11376
	EG and G Idaho, Inc., Idaho Falls, ID (United States)	
	20:236	DOE/LLW–103-Rev.1
	20:239	DOE/LLW–188
	20:256	EGG-M–94273
	20:257	EGG-NRE–11451
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	20:801	EGG-NRE–11406
	20:802	EGG-RAAM–11041
	20:803	EGG-RAAM–11088
	20:816	EGG-M–94222
	20:1077	EGG-EP–11237-Qtr1
	20:1078	EGG-EP–11320
	20:1786	DOE/LLW–207
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	20:2434	EGG-FSP–11193
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	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	20:2432	DOE/ER/54186–T4
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research	
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	EG and G Idaho, Inc., Idaho Falls, ID (United States). National Low-Level Waste Management Program	
	20:237	DOE/LLW–139
	Environmental Research and Development, Inc., Idaho Falls, ID (United States)	
	20:1042	EGG-WTD–11403
AC07-81NE44139	**Argonne National Lab., IL (United States). Chemical Technology Div.**	
	20:217	ANL/CMT/PP–78044
AC08-81NV10162	**Nevada Univ., Las Vegas, NV (United States). Desert Research Inst.**	
	20:1850	DOE/NV/10162–21
AC08-94NV11432	**Reynolds Electrical and Engineering Co., Inc., Las Vegas, NV (United States)**	
	20:241	DOE/NV/11432–123-Vol.1
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	20:1789	DOE/NV/11432–162
AC09-76SR00001	**Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States)**	
	20:864	SR/H–751
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	Du Pont de Nemours (E.I.) and Co., Aiken, SC (United States). Savannah River Plant	
	20:865	SR/H–755
	20:866	SR/H–756
	20:867	SR/H–758
	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States)	
	20:153	DPW–53-1343-Del.Ver.
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	20:155	DPW–55-17-15
	20:156	DPW–55-17-17
	20:157	DPW–55-17-19
	20:165	DPW–55-4-6
	20:166	DPW–55-4-7
	20:167	DPW–55-4-12

Contract No.	Abstract No.	Report No.
	20:168	DPW–55-4-13
	20:169	DPW–55-4-14
	20:170	DPW–55-4-17
	20:171	DPW–55-4-18
	20:172	DPW–55-4-19
	20:173	DPW–55-4-21
	20:174	DPW–55-4-29
	20:175	DPW–55-4-32
	20:176	DPW–55-4-33
	20:177	DPW–55-4-34
	20:178	DPW–55-4-36
	20:179	DPW–55-4-38
	20:180	DPW–55-4-39
	20:181	DPW–55-4-41
	20:182	DPW–55-4-42
	20:183	DPW–55-4-43
	20:184	DPW–55-4-44
	20:846	DPW–55-17-4
	20:847	DPW–55-17-9
	20:848	DPW–55-17-10
	20:849	DPW–55-17-11
	20:850	DPW–55-17-12
	20:851	DPW–55-17-13
	20:852	DPW–55-17-14
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	Du Pont de Nemours (E.I.) and Co., Wilmington, DE (United States). Atomic Energy Div.	
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	20:254	DPW–55-15-12
	20:742	DPW–56-394
	20:825	DPW–53-1362-Del.Ver.
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	20:841	DPW–53-1146-Del.Ver.
	20:842	DPW–53-1311
	20:843	DPW–54-200-Del.Ver.
	20:844	DPW–55-15-5
	20:845	DPW–55-16-41
	20:854	DPW–55-17-21
	20:855	DPW–55-17-22
	20:872	DPW–53-1402-Del.Ver.
	20:1434	DPW–56-371
AC09-89SR18035	**Westinghouse Savannah River Co., Aiken, SC (United States)**	
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	20:211	WSRC-MS–94-0563
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	20:271	EPD-SGS–94-307
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	20:430	WSRC-RP–92-376
	20:431	WSRC-TR–93-762
	20:432	WSRC-TR–94-0243
	20:433	WSRC-TR–94-0244
	20:434	WSRC-TR–94-0245
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	20:436	WSRC-TR–94-0296
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	20:439	WSRC-TR–94-0346
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	20:441	WSRC-TR–94-0348
	20:442	WSRC-TR–94-0385
	20:443	WSRC-TR–94-0387
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	20:474	WSRC-RP–93-67-4-Vol.2
	20:475	WSRC-TR–94-0246
	20:476	WSRC-TR–94-0351
	20:477	WSRC-TR–94-0425
	20:540	WSRC-IM–94-42
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	20:543	WSRC-TR–94-0361
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AC11-93PN38195	**Bettis Atomic Power Lab., West Mifflin, PA (United States)**	
	20:460	NRFEM(EC)–740
	20:468	WAPD-RC/E(EE)–3300
AC21-86MC23166	**Solar Turbines, Inc., San Diego, CA (United States)**	
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	20:82	DOE/MC/23166–3869
AC21-87MC24257	**Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center**	
	20:9	DOE/MC/24257–3796
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AC21-88MC25185	**Energy and Environmental Research Corp., Irvine, CA (United States)**	
	20:62	DOE/MC/25185–3301
AC21-89MC26006	**Department of Energy, Morgantown, WV (United States). Morgantown Energy Technology Center**	
	20:1008	DOE/MC/26006–3804
	Allied-Signal Aerospace Co., Torrance, CA (United States). AiResearch Los Angeles Div.	
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AC21-89MC26026	**West Virginia Coll., Beckley, WV (United States)**	
	20:131	DOE/MC/26026–3902
AC21-90MC27423	**Combustion Power Co., Inc., Menlo Park, CA (United States)**	
	20:12	DOE/MC/27423–3874
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AC21-92MC28016	**North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center**	
	20:63	DOE/MC/28016–94/C0378
AC21-92MC28202	**CRS Sirrine Engineers, Inc., Greenville, SC (United States)**	
	20:14	DOE/MC/28202–94/C0351
AC21-92MC29109	**Engineering Computer Opteconomics, Inc., Annapolis, MD (United States)**	
	20:1788	DOE/MC/29109–3898
AC21-92MC29113	**Mechanical Technology, Inc., Latham, NY (United States)**	
	20:1433	DOE/MC/29113–3912
AC21-92MC29246	**Minnesota Univ., Minneapolis, MN (United States)**	
	20:15	DOE/MC/29246–3772
AC21-92MC29261	**Energy Research Corp., Danbury, CT (United States)**	
	20:64	DOE/MC/29261–94/C0377
AC21-93MC28139	**Energy and Environmental Analysis, Inc., Arlington, VA (United States)**	
	20:135	DOE/MC/28139–3878

Contract No.	Abstract No.	Report No.
AC21-93MC30040	Advanced Fuel Research, Inc., East Hartford, CT (United States)	
	20:729	DOE/MC/30040–94/C0380
AC21-93MC30086	Advanced Resources International, Inc., Arlington, VA (United States)	
	20:132	DOE/MC/30086–3888
	20:133	DOE/MC/30086–3889
AC21-94MC30012	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Chemical Engineering	
	20:16	DOE/MC/30012–3861
AC22-88PC88819	Amoco Oil Co., Naperville, IL (United States). Research and Development Dept.	
	20:19	DOE/PC/88819–T8
	20:20	DOE/PC/88819–T12
	20:21	DOE/PC/88819–T13
	20:22	DOE/PC/88819–T14
	20:23	DOE/PC/88819–T15
	20:24	DOE/PC/88819–T16
	20:25	DOE/PC/88819–T17
AC22-90BC14653	USDOE Bartlesville Project Office, OK (United States)	
	20:95	DOE/BC/14653–3
AC22-91PC90057	Amoco Oil Co., Naperville, IL (United States). Research and Development Dept.	
	20:26	DOE/PC/90057–T3
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	20:28	DOE/PC/90057–T5
	20:29	DOE/PC/90057–T6
	20:30	DOE/PC/90057–T7
	20:31	DOE/PC/90057–T8
AC22-91PC90181	New Jersey Inst. of Tech., Newark, NJ (United States)	
	20:1671	DOE/PC/90181–T12
AC22-91PC91034	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	20:33	DOE/PC/91034–T9
AC22-91PC91043	Western Research Inst., Laramie, WY (United States)	
	20:3	DOE/PC/91043–T12
AC22-91PC91160	ABB Combustion Engineering, Windsor, CT (United States). Power Plant Labs.	
	20:88	DOE/PC/91160–T3
AC22-92BC14831	Louisiana State Univ., Baton Rouge, LA (United States). Dept. of Petroleum Engineering	
	20:111	DOE/BC/14831–11
AC22-92BC14880	New Mexico Inst. of Mining and Technology, Socorro, NM (United States). New Mexico Petroleum Recovery Research Center	
	20:114	DOE/BC/14880–9
AC22-92MT92008	Pennsylvania State Univ., University Park, PA (United States). Mineral Engineering, Petroleum and Natural Gas Engineering Section	
	20:128	DOE/MT/92008–8
AC22-92MT92012	Mission Research Corp., San Diego, CA (United States)	
	20:120	DOE/MT/92012–7
AC22-92PC91047	Viking Systems International, Inc., Pittsburgh, PA (United States)	
	20:54	DOE/PC/91047–T9
AC22-92PC91343	IGR Enterprises, Inc., Cleveland, OH (United States)	
	20:736	DOE/PC/91343–T6
AC22-92PC91346	Carnegie-Mellon Univ., Pittsburgh, PA (United States). Center for Energy and Environmental Studies	
	20:737	DOE/PC/91346–7
AC22-92PC92112	SRI International, Menlo Park, CA (United States)	
	20:631	DOE/PC/92112–T6
	20:632	DOE/PC/92112–T7
AC22-92PC92118	Engineering Resources, Inc., Fayetteville, AR (United States)	
	20:36	DOE/PC/92118–T7
AC22-92PC92159	Combustion Engineering, Inc., Windsor, CT (United States)	
	20:738	DOE/PC/92159–T8
AC22-92PC92246	Virginia Center for Coal and Minerals Processing, Blacksburg, VA (United States)	
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AC22-93BC14896	Utah Geological and Mineral Survey, Salt Lake City, UT (United States)	
	20:96	DOE/BC/14896–3
AC22-93PC92120	Media and Process Technology, Inc., Pittsburgh, PA (United States)	
	20:37	DOE/PC/92120–T5
AC22-93PC92206	AMAX Research and Development Center, Golden, CO (United States)	
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AC34-90DP62349	EG and G Rocky Flats, Inc., Golden, CO (United States)	
	20:312	RFP–4873
	20:559	RFP–4883
	EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
	20:311	RFP–4834
	20:911	RFP-ADD–0030
AC34-90RF62349	EG and G Rocky Flats, Inc., Golden, CO (United States). Rocky Flats Plant	
	20:313	RFP–4890
AC35-89ER40486	Superconducting Super Collider Lab., Dallas, TX (United States)	
	20:1596	SSCL–649
	20:1597	SSCL–676
	20:1599	SSCL–688
	Superconducting Super Collider Lab., Waxahachie, TX (United States)	
	20:1540	SSCL–678
	20:1598	SSCL–679
	20:1600	SSCL–689
AC36-83CH10093	National Renewable Energy Lab., Golden, CO (United States)	
	20:614	DOE/FTR–94008306
	20:629	NREL/CP–433-7265
	20:642	NREL/SP–463-6156
	20:684	NREL/TP–411-7170
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	20:686	NREL/TP–411-7350
	20:687	NREL/TP–451-6638
	20:688	NREL/TP–451-7162
	20:689	NREL/TP–451-7166
	20:690	NREL/TP–451-7189
	20:724	NREL/CP–442-6877
	20:726	DOE/GO–10094-010
	20:1001	NREL/TP–442-7227
	20:1083	NREL/TP–473-7260
AI01-90EW50011	Corps of Engineers, Tulsa, OK (United States)	
	20:1739	DOE/EW/50011–T1
AI01-93CE16078	Wander Associates (United States)	
	20:626	TVA/NFERC–93/8
AI05-86ER40298	National Committee on Tunneling Technology, Washington, DC (United States)	
	20:1677	CONF-8512135–Summ.
AI05-89OR21865	Geological Survey, Las Vegas, NV (United States)	
	20:454	DOE/OR/21865–1

Contract No.	Abstract No.	Report No.
AI32-91AL72730	National Inst. of Environmental Health Sciences, Research Triangle Park, NC (United States). Lab. of Molecular Genetics	
	20:1866	LA-SUB-94-163
AI34-93RF00674	Geological Survey, Denver, CO (United States)	
	20:1840	USGS-OFR-94-162
AS03-76ER70285	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:1609	SLAC-PUB-6533
FC02-92CE41000	General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center	
	20:1063	DOE/CE/41000-2
FC02-93ER54186	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	20:1110	DOE/ER/54186-T3
	20:2431	DOE/ER/54186-T2
	20:2432	DOE/ER/54186-T4
	20:2433	DOE/ER/54186-T5
FC02-93ER54209	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	20:2407	DOE/FTR-94005434
FC07-89ID12847	American Iron and Steel Inst., Pittsburgh, PA (United States)	
	20:1111	DOE/ID/12847-7
FC07-91ID13074	Kansas State Univ., Manhattan, KS (United States)	
	20:1076	DOE/ID/13074-T13
FC07-94ID13233	Ohio State Univ., Columbus, OH (United States). Center for Die Casting	
	20:1112	DOE/ID/13233-T1
FC21-90MC26008	Hague International, South Portland, ME (United States)	
	20:83	DOE/MC/26008-3769
FC21-90MC27286	Kentucky Univ., Lexington, KY (United States). Center for Applied Energy Research	
	20:140	DOE/MC/27286-3891
FC21-92MC27391	Kerr-McGee Coal Corp., Oklahoma City, OK (United States)	
	20:11	DOE/MC/27391-3892
FC21-92MC28065	M-C Power Corp., Burr Ridge, IL (United States)	
	20:1011	DOE/MC/28065-3880
FC21-92MC28245	Atomic Energy of Canada Ltd., Chalk River, ON (Canada)	
	20:1787	DOE/MC/28245-3909
FC21-92MC29061	Clemson Univ., SC (United States)	
	20:727	DOE/MC/29061-3868
FC21-93MC29444	TAMCO Power Partners, Williamsport, PA (United States)	
	20:728	DOE/MC/29444-3893
FC21-93MC30098	North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center	
	20:139	DOE/MC/30098-3915
FC21-93MC30127	Western Research Inst., Laramie, WY (United States)	
	20:927	DOE/MC/30127-3917
FC22-90PC89651	Southern Co. Services, Inc., Birmingham, AL (United States)	
	20:80	CONF-9409160-1
	20:84	DOE/PC/89651-T14
FC22-90PC89653	Southern Co. Services, Inc., Birmingham, AL (United States)	
	20:85	DOE/PC/89653-T15
	20:86	DOE/PC/89653-T16
FC22-91PC90548	LIFAC North America, Inc., Pittsburgh, PA (United States)	
	20:67	DOE/PC/90548-T13
FC22-92PC92521	Illinois Dept. of Energy and Natural Resources, Springfield, IL (United States)	
	20:38	DOE/PC/92521-T131
	20:56	DOE/PC/92521-T151
FC22-93BC14953	Geological Survey, Salt Lake City, UT (United States)	
	20:97	DOE/BC/14953-5-Pt.1
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FC22-93BC14959	Texas Univ., Austin, TX (United States). Bureau of Economic Geology	
	20:99	DOE/BC/14959-10
FC22-93BC14961	Columbia Univ., Palisades, NY (United States). Lamont-Doherty Earth Observatory	
	20:116	DOE/BC/14961-5
FC22-93BC14963	Amoco Production Co., Houston, TX (United States)	
	20:117	DOE/BC/14963-5
FC22-94BC14989	Fina Oil and Chemical Co., Midland, TX (United States). Western Div.	
	20:118	DOE/BC/14989-1
FC22-94PC94118	Control Techtronics, Inc., Harrisburg, PA (United States)	
	20:91	DOE/PC/94118-T1
FG01-90CE15479	Sundyne Co., Sarasota, FL (United States)	
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FG01-91CE15520	State Univ. of New York, Buffalo, NY (United States)	
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FG01-92CE15553	Southern California Research Corp., San Rafael, CA (United States)	
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FG01-92EW50625	Medical Univ. of South Carolina, Charleston, SC (United States)	
	20:916	DOE/EW/50625-T19
	20:2448	DOE/EW/50625-T18-Vol.1
	20:2449	DOE/EW/50625-T18-Vol.2
	20:2450	DOE/EW/50625-T18-Vol.3
FG01-93CE15557	Energy Concepts Co., Annapolis, MD (United States)	
	20:1016	DOE/CE/15557-T4
FG01-93EP10050	East-West Center, Honolulu, HI (United States)	
	20:973	DOE/EP/10050-T1
	20:974	DOE/EP/10050-T2
FG01-94CE15594	Bio-Process Innovation, Inc., West Lafayette, IN (United States)	
	20:620	DOE/CE/15594-T2
FG01-94CE15613	Burton Technologies, Inc., Raleigh, NC (United States)	
	20:1242	DOE/CE/15613-T2
FG02-84ER13282	Massachusetts Inst. of Tech., Cambridge, MA (United States). Dept. of Chemical Engineering	
	20:1420	DOE/ER/13282-10
FG02-84ER13289	Harvard Univ., Cambridge, MA (United States). Dept. of Chemistry	
	20:1294	DOE/ER/13289-T2
FG02-84ER45076	Lawrence Livermore National Lab., CA (United States)	
	20:2342	UCRL-JC-117613
FG02-84ER45166	Carnegie-Mellon Univ., Pittsburgh, PA (United States)	
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FG02-84ER53188	Missouri Univ., Rolla, MO (United States)	
	20:2403	DOE/ER/53188-1

Contract No.	Abstract No.	Report No.
FG02-85ER45184	Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering	
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FG02-86ER13506	Syracuse Univ., NY (United States). Dept. of Chemistry	
	20:2311	DOE/ER/13506–52
FG02-86ER13519	Cornell Univ., Ithaca, NY (United States)	
	20:2288	DOE/ER/13519–8
FG02-86ER25012	Yale Univ., New Haven, CT (United States). Dept. of Computer Science	
	20:2534	DOE/ER/25012–5
	20:2535	DOE/ER/25012–6
FG02-86ER45252	Pennsylvania State Univ., University Park, PA (United States). Dept. of Materials Science and Engineering	
	20:1176	DOE/ER/45252–T6
FG02-87ER13773	Yale Univ., New Haven, CT (United States)	
	20:1341	DOE/ER/13773–5
	20:1342	DOE/ER/13773–6
FG02-87ER25027	Northwestern Univ., Evanston, IL (United States)	
	20:1422	DOE/ER/25027–8
FG02-87ER40344	Northwestern Univ., Evanston, IL (United States)	
	20:2079	DOE/ER/40344–8
FG02-87ER45283	State Univ. of New York, Buffalo, NY (United States). Dept. of Physics	
	20:1245	DOE/ER/45283–8
FG02-87ER45313	Massachusetts Inst. of Tech., Cambridge, MA (United States)	
	20:1170	CONF-880118–1
	Massachusetts Inst. of Tech., Cambridge, MA (United States). Materials Processing Center	
	20:1171	CONF-890130–6
FG02-87ER45330	Dartmouth Coll., Hanover, NH (United States)	
	20:1246	DOE/ER/45330–T1
FG02-88ER40408	Lawrence Berkeley Lab., CA (United States)	
	20:2271	LBL–36105
FG02-88ER40412	Lawrence Berkeley Lab., CA (United States)	
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FG02-88ER40413	Lawrence Berkeley Lab., CA (United States)	
	20:2178	LBL–36033
FG02-88ER40417	Brookhaven National Lab., Upton, NY (United States)	
	20:2203	BNL–60785
	20:2204	BNL–60796
	20:2206	BNL–60808
FG02-88ER60631	Columbia Univ., New York, NY (United States). Center for Radiological Research	
	20:1912	DOE/ER/60631–13
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FG02-88ER60639	Michigan Univ., Ann Arbor, MI (United States)	
	20:1873	DOE/ER/60639–6
FG02-88ER60675	Mount Sinai School of Medicine, New York, NY (United States). Dept. of Physiology and Biophysics	
	20:1914	DOE/ER/60675–7
FG02-89ER14083	Utah Univ., Salt Lake City, UT (United States)	
	20:1779	DOE/ER/14083–2
FG02-89ER40531	Lawrence Berkeley Lab., CA (United States)	
	20:2271	LBL–36105
FG02-89ER60773	Illinois Univ., Urbana, IL (United States). Dept. of Civil Engineering	
	20:1780	DOE/ER/60773–4
FG02-90ER14104	Columbia Univ., New York, NY (United States). Columbia Radiation Lab.	
	20:1375	DOE/ER/14104–5
FG02-90ER14114	Rensselaer Polytechnic Inst., Troy, NY (United States)	
	20:1343	DOE/ER/14114–4
FG02-90ER14145	Colorado Univ., Boulder, CO (United States)	
	20:2292	DOE/ER/14145–T3
FG02-90ER25086	Colorado Univ., Boulder, CO (United States). Applied Mathematics Program	
	20:2278	DOE/ER/25086–T2
FG02-90ER45434	Northwestern Univ., Evanston, IL (United States)	
	20:1247	DOE/ER/45434–4
FG02-90ER60931	Oak Ridge National Lab., TN (United States)	
	20:1948	CONF-9407126–1
FG02-90ER61030	Princeton Univ., NJ (United States). Center for Energy and Environmental Studies	
	20:1707	DOE/ER/61030–T1
FG02-90ER61071	Pennsylvania State Univ., University Park, PA (United States)	
	20:1708	DOE/ER/61071–T1
FG02-90ER61077	Pennsylvania State Univ., University Park, PA (United States)	
	20:1949	DOE/ER/61077–8
FG02-90ER80896	CeraMem Corp., Waltham, MA (United States)	
	20:60	DOE/ER/80896–94/C0379
FG02-91CE23810	Air-Conditioning and Refrigeration Technology Inst., Inc., Arlington, VA (United States)	
	20:1243	DOE/CE/23810–39
FG02-91ER12108	Illinois Univ., Chicago, IL (United States). Lab. for Atomic, Molecular, and Radiation Physics	
	20:2279	DOE/ER/12108–T1
FG02-91ER14185	Rochester Univ., NY (United States). Dept. of Chemistry	
	20:682	DOE/ER/14185–T1
FG02-91ER14225	Columbia Univ., New York, NY (United States). Dept. of Chemistry	
	20:1344	DOE/ER/14225–3
FG02-91ER40672	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
FG02-91ER40676	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
FG02-91ER40677	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
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FG02-92ER12125	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Systems Research	
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FG02-92ER14258	Pennsylvania State Univ., University Park, PA (United States)	
	20:1345	DOE/ER/14258–2
FG02-92ER40697	State Univ. of New York, Albany, NY (United States). Research Foundation	
	20:2029	DOE/ER/40697–3

Contract No.	Abstract No.	Report No.
FG02-92ER40715	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:1656	SLAC-PUB–6686
FG02-92ER40723	Massachusetts Univ., Lowell, MA (United States). Radiation Lab.	
	20:2276	DOE/ER/40723–2
FG02-92ER61447	State Univ. of New York, Albany, NY (United States). Atmospheric Sciences Research Center	
	20:1709	DOE/ER/61447–1
FG02-92ER75698	National Technological Univ., Fort Collins, CO (United States)	
	20:926	DOE/ER/75698–T1
FG02-92ER81349	Industrial Filter and Pump Mfg. Co., Inc., Cicero, IL (United States)	
	20:61	DOE/ER/81349–94/C0356
FG02-93ER12130	Michigan Univ., Ann Arbor, MI (United States). Dept. of Nuclear Engineering	
	20:807	DOE/ER/12130–T1
FG02-93ER40768	State Univ. of New York, Stony Brook, NY (United States). Dept. of Physics	
	20:2236	DOE/ER/40768–2
FG02-93ER61640	Harvard Univ., Cambridge, MA (United States)	
	20:1864	DOE/ER/61640–T1
FG03-84ER45085	Stanford Univ., CA (United States)	
	20:1244	DOE/ER/45085–T2
FG03-84ER45157	Stanford Univ., CA (United States). Edward L. Ginzton Lab.	
	20:1175	DOE/ER/45157–T6
	20:1497	CONF-880760–13
	20:1670	DOE/ER/45157–T7
FG03-87ER13797	Stanford Univ., CA (United States). Edward L. Ginzton Lab.	
	20:1482	DOE/ER/13797–T1
FG03-88ER40424	Lawrence Berkeley Lab., CA (United States)	
	20:2178	LBL–36033
FG03-88ER40439	Temple Univ., Philadelphia, PA (United States)	
	20:2190	DOE/ER/40439–T2
FG03-89ER14053	University of Southern California, Los Angeles, CA (United States). Dept. of Chemistry	
	20:1421	DOE/ER/14053–T6
FG03-89ER60886	California Univ., Davis, CA (United States)	
	20:1862	DOE/ER/60886–T3
FG03-90ER40546	California Univ., San Diego, CA (United States)	
	20:2028	DOE/ER/40546–T6
FG03-91ER40618	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
FG03-92ER40689	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
FG03-92ER40701	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
FG03-92ER45476	Nevada Univ., Reno, NV (United States). Dept. of Chemistry	
	20:1376	DOE/ER/45476–T1
FG03-92SF19202	Naval Research Lab., Washington, DC (United States)	
	20:2281	DOE/SF/19202–T1
FG03-93ER14333	Utah Univ., Salt Lake City, UT (United States). Dept. of Chemistry	
	20:1296	DOE/ER/14333–T1
FG03-93ER14381	Brookhaven National Lab., Upton, NY (United States)	
	20:895	BNL–60533
FG03-93ER25149	IG Technologies, San Diego, CA (United States)	
	20:2536	DOE/ER/25149–T1
FG03-93ER40759	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:1614	SLAC-PUB–6553
FG03-93ER40788	Stanford Linear Accelerator Center, Menlo Park, CA (United States)	
	20:2181	SLAC-PUB–6586
	20:2199	SLAC-PUB–6595
FG04-87AL43771	Princeton Univ., NJ (United States). Dept. of Mechanical and Aerospace Engineering	
	20:130	DOE/AL/43771–T4
FG04-88ER60662	New Mexico Inst. of Mining and Technology, Socorro, NM (United States). Dept. of Physics	
	20:1706	DOE/ER/60662–T3
FG04-91AL73394	Arizona Energy Office, Phoenix, AZ (United States)	
	20:709	DOE/AL/73394–T1-Exec.Summ.
	20:710	DOE/AL/73394–T1-Pt.2
FG04-94AL99286	Maine Metal Products Association, Portland, ME (United States)	
	20:1039	DOE/AL/99286–T2
FG05-80ET53088	Texas Univ., Austin, TX (United States). Inst. for Fusion Studies	
	20:2009	DOE/ET/53088–672
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	20:2406	DOE/ET/53088–678
FG05-85ER13434	Texas A and M Univ., College Station, TX (United States). Dept. of Chemistry	
	20:1295	DOE/ER/13434–T2
FG05-85ER40200	Texas Univ., Austin, TX (United States)	
	20:2033	DOE/ER/40200–323
FG05-85ER40219	Fermi National Accelerator Lab., Batavia, IL (United States)	
	20:2149	DOE/ER/40561–137
FG05-86ER13633	North Carolina Univ., Chapel Hill, NC (United States)	
	20:1374	DOE/ER/13633–12
FG05-87OR21755	Missouri Univ., Rolla, MO (United States). Dept. of Natural Resources	
	20:1791	DOE/OR/21755–T4
FG05-88ER40437	Lawrence Berkeley Lab., CA (United States)	
	20:2271	LBL–36105
FG05-88ER40445	Lawrence Berkeley Lab., CA (United States)	
	20:2178	LBL–36033
FG05-89ER40505	National Academy of Sciences - National Research Council, Washington, DC (United States)	
	20:2202	DOE/ER/40505–T1
FG05-89ER75464	American Chemical Society, Washington, DC (United States). Div. of Nuclear Chemistry and Technology	
	20:1410	DOE/ER/75464–3
FG05-91ER35127	National Academy of Sciences - National Research Council, Washington, DC (United States)	
	20:906	CONF-9110540–Summ.
FG05-93ER79236	North Carolina State Univ., Raleigh, NC (United States)	
	20:2312	DOE/ER/79236–1
FG06-87ER53243	Washington Univ., Seattle, WA (United States)	
	20:2404	DOE/ER/53243–6

Contract No.	Abstract No.	Report No.
FG06-89ER60845	Oregon Graduate Inst. of Science and Technology, Portland, OR (United States). Dept. of Environmental Science and Engineering	
	20:1781	DOE/ER/60845–4
FG06-90ER40561	Washington Univ., Seattle, WA (United States)	
	20:2034	DOE/ER/40561–142
	20:2080	DOE/ER/40561–130
	20:2081	DOE/ER/40561–133
	20:2235	DOE/ER/40561–141
	Fermi National Accelerator Lab., Batavia, IL (United States)	
	20:2149	DOE/ER/40561–137
FG07-90ID13040	Oregon Inst. of Tech., Klamath Falls, OR (United States). Geo-Heat Center	
	20:716	DOE/ID/13040–T25
FG07-91ID13042	Idaho State Univ., Pocatello, ID (United States)	
	20:493	DOE/ID/13042–38
FG08-94NV11502	Fisk Univ., Nashville, TN (United States). Dept. of Physics	
	20:1621	DOE/NV/11502–T2
FG09-84ER13188	Georgia Univ., Athens, GA (United States). Research Foundation	
	20:1894	DOE/ER/13188–9
FG09-85ER13425	Georgia Univ., Athens, GA (United States). Complex Carbohydrate Research Center	
	20:1892	DOE/ER/13425–T2
FG09-85ER13426	Georgia Univ., Athens, GA (United States). Complex Carbohydrate Research Center	
	20:1893	DOE/ER/13426–T2
FG09-86ER13614	Georgia Univ., Athens, GA (United States)	
	20:1846	DOE/ER/13614–T1
	Georgia Univ., Athens, GA (United States). Research Foundation	
	20:1847	DOE/ER/13614–T2
FG22-89BC14431	Interstate Oil Compact Commission, Oklahoma City, OK (United States)	
	20:106	DOE/BC/14431–1-App.
	20:107	DOE/BC/14431–1-Vol.1
	20:108	DOE/BC/14431–1-Vol.3
	20:109	DOE/BC/14431–1-Vol.4
	20:110	DOE/BC/14431–1-Vol.5
FG22-89PC89769	Illinois Inst. of Tech., Chicago, IL (United States). Dept. of Chemical Engineering	
	20:87	DOE/PC/89769–T17
FG22-90PC90293	Georgia Inst. of Tech., Atlanta, GA (United States). School of Chemical Engineering	
	20:32	DOE/PC/90293–T14
FG22-90PC90311	Utah Univ., Salt Lake City, UT (United States)	
	20:1	DOE/PC/90311–14
	20:2	DOE/PC/90311–15
	20:1297	DOE/PC/90311–16
FG22-91PC91284	Stanford Univ., CA (United States). Dept. of Civil Engineering	
	20:55	DOE/PC/91284–11
FG22-91PC91297	Clarkson Univ., Potsdam, NY (United States). Dept. of Mechanical and Aeronautical Engineering	
	20:78	DOE/PC/91297–T7
FG22-91PC91304	Pittsburgh Univ., PA (United States). Dept. of Chemical and Petroleum Engineering	
	20:34	DOE/PC/91304–T11
FG22-91PC91308	Brigham Young Univ., Provo, UT (United States)	
	20:89	DOE/PC/91308–10
FG22-91PC91310	University of Wyoming Research Corp., Laramie, WY (United States). Western Research Inst.	
	20:35	DOE/PC/91310–T11
FG22-92BC14856	Kansas Univ., Lawrence, KS (United States). Energy Research Center	
	20:112	DOE/BC/14856–T1
FG22-92MT92018	Hampton Univ., VA (United States). Dept. of Engineering	
	20:65	DOE/MT/92018–3
	20:66	DOE/MT/92018–7
FG22-92MT92021	Morgan State Univ., Baltimore, MD (United States). School of Engineering	
	20:1490	DOE/MT/92021–7
FG22-92PC92152	Carnegie-Mellon Univ., Pittsburgh, PA (United States). Dept. of Mechanical Engineering	
	20:1493	DOE/PC/92152–T11
FG22-92PC92527	University of Southern California, Los Angeles, CA (United States). Dept. of Chemical Engineering	
	20:57	DOE/PC/92527–T7
FG22-92PC92535	Northeastern Univ., Boston, MA (United States)	
	20:739	DOE/PC/92535–T7
FG22-92PC92539	Tulsa Univ., OK (United States). Dept. of Chemical Engineering	
	20:1423	DOE/PC/92539–8
FG22-92PC92542	Lehigh Univ., Bethlehem, PA (United States)	
	20:90	DOE/PC/92542–T7
FG22-93BC14862	Stanford Univ., CA (United States). Dept. of Petroleum Engineering	
	20:113	DOE/BC/14862–6
FG22-93BC14899	University of Southern California, Los Angeles, CA (United States)	
	20:115	DOE/BC/14899–17
FG22-93MT93006	Morgan State Univ., Baltimore, MD (United States). School of Engineering	
	20:1491	DOE/MT/93006–3
FG22-93PC93205	Delaware Univ., Newark, DE (United States). Center for Catalytic Science and Technology	
	20:39	DOE/PC/93205–T4
FG22-93PC93211	Oak Ridge National Lab., TN (United States)	
	20:1293	CONF-941129–7
FG22-93PC93214	Michigan Technological Univ., Houghton, MI (United States). Dept. of Metallurgical and Materials Engineering	
	20:68	DOE/PC/93214–T4
FG22-93PC93215	Nevada Univ., Reno, NV (United States)	
	20:40	DOE/PC/93215–T3
FG22-93PC93224	South Carolina Univ., Columbia, SC (United States). Dept. of Biological Sciences	
	20:41	DOE/PC/93224–T4
FG22-93PC93227	Mississippi Univ., University, MS (United States). Dept. of Chemical Engineering	
	20:69	DOE/PC/93227–T3
FG22-94PC94224	Virginia Polytechnic Inst. and State Univ., Blacksburg, VA (United States). Dept. of Materials Science and Engineering	
	20:1177	DOE/PC/94224–T1
W-31109-ENG-38	Argonne National Lab., IL (United States)	
	20:59	ANL/ESD–24
	20:216	ANL–94/19
	20:218	ANL/EAD/LD–2
	20:220	ANL/RE/PP–79448
	20:717	ANL/ER/CP–82594
	20:820	ANL/RE/CP–80730
	20:839	ANL/ET/CP–84257

Contract No.	Abstract No.	Report No.
	20:985	ANL/DIS/CP–84102
	20:997	ANL/ESD/TM–76
	20:1006	ANL/CMT/CP–84205
	20:1072	ANL/ES/CP–82394
	20:1073	ANL/ES/CP–82395
	20:1081	PATENTS-US–A7952439
	20:1168	ANL/ET/CP–82340
	20:1169	ANL/ET/CP–83313
	20:1239	ANL/IPNS/PP–79589
	20:1291	ANL/CHM/CP–81118
	20:1466	CONF-9404137–
	20:1773	ANL/EA/CP–84264
	20:1906	ANL/EAD/TM–24
	20:2030	ANL-HEP-TR–94-57
	20:2201	ANL–94/31
	20:2346	ANL/MCS/PP–71694
	20:2429	ANL/TD/CP–83926
	20:2430	ANL/TD/CP–83927
	20:2524	ANL/MCS/CP–84282
	20:2525	ANL/MCS/CP–84283
	Argonne National Lab., IL (United States). Chemical Technology Div.	
	20:217	ANL/CMT/PP–78044
	Argonne National Lab., IL (United States). Mathematics and Computer Science Div.	
	20:1478	ANL/ET/CP–82313
	20:1863	ANL/MCS/PP–73221
	20:2526	ANL/MCS/PP–72994
	20:2527	ANL/MCS/PP–75185
	20:2528	ANL/MCS/PP–75731
	20:2529	ANL/MCS/PP–76460
	20:2530	ANL/MCS/PP–77544
	Los Alamos National Lab., NM (United States)	
	20:1080	PATENTS-US–A7952247
	Argonne National Lab., IL (United States). Energy Systems Div.	
	20:734	ANL/ESD/TM–75
	Argonne National Lab., IL (United States). Energy Technology Div.	
	20:134	ANL/ET/CP–83730
	20:219	ANL/ET/CP–83175
	20:924	ANL/ET/RP–83893
	20:1100	ANL/ET/CP–81606
	Argonne National Lab., Idaho Falls, ID (United States). Technology Development Div.	
	20:1871	ANL/TD/CP–82768
W-7405-ENG-36	**EG and G Idaho, Inc., Idaho Falls, ID (United States)**	
	20:801	EGG-NRE–11406
	Los Alamos National Lab., NM (United States)	
	20:122	LA-UR–94-2871
	20:286	LA–12792-PR
	20:287	LA-SUB–94-159
	20:288	LA-UR–94-2891
	20:289	LA-UR–94-3196
	20:290	LA-UR–94-3359
	20:291	LA-UR–94-3491
	20:459	LA-SUB–94-139
	20:502	LA–12846-MS
	20:503	LA-UR–94-3373
	20:557	LA–12816-PR
	20:558	LA-UR–94-2082
	20:612	LA–12873-PR
	20:788	LA-SUB–94-143
	20:791	LA-UR–94-2701
	20:1002	LA-UR–94-1938
	20:1097	LA-SUB–94-153
	20:1154	LA–12836-MS
	20:1155	LA-UR–94-2845
	20:1156	LA-UR–94-3284
	20:1157	LA-UR–94-3499
	20:1158	LA-UR–94-3656
	20:1237	LA-UR–94-3537
	20:1238	LA-UR–94-3568
	20:1330	LA-UR–94-2736
	20:1331	LA-UR–94-3331
	20:1419	PATENTS-US–A7950552
	20:1440	LA-SUB–94-137
	20:1441	LA-UR–94-3181
	20:1475	LA-UR–94-3449
	20:1476	LA-UR–94-3611
	20:1487	LA–12848-MS
	20:1502	LA-SUB–94-132
	20:1503	LA-UR–94-3057
	20:1521	LA–12835-C
	20:1522	LA-UR–94-3462
	20:1539	LA-UR–94-3351
	20:1586	LA-SUB–94-149
	20:1587	LA-UR–94-3213
	20:1588	LA-UR–94-3362
	20:1589	LA-UR–94-3388
	20:1649	LA-UR–94-3167
	20:1650	LA-UR–94-3244
	20:1651	LA-UR–94-3344
	20:1665	LA–12865
	20:1678	LA-SUB–94-141
	20:1679	LA-SUB–94-148
	20:1687	LA-UR–94-3316
	20:1693	LA-UR–94-3170
	20:1694	LA-UR–94-3171
	20:1763	LA–12636
	20:1764	LA-SUB–94-140
	20:1765	LA-UR–94-3132
	20:1766	LA-UR–94-3399
	20:1767	LA-UR–94-3674
	20:1856	LA-UR–94-3595
	20:1867	LA-UR–94-3138
	20:1868	LA-UR–94-3139
	20:1869	LA-UR–94-3160
	20:1967	LA-UR–94-3210
	20:1971	LA-UR–94-3124
	20:1972	LA-UR–94-2739
	20:2001	LA-UR–94-3329
	20:2221	LA-SUB–94-131
	20:2266	LA–12639-MS
	20:2267	LA-SUB–94-142
	20:2295	LA-UR–94-3533
	20:2417	LA-UR–94-3666
	20:2441	LA-UR–94-3165
	20:2442	LA-UR–94-3221
	20:2443	LA-UR–94-3665
	20:2444	LA-UR–94-3667
	20:2516	LA-UR–94-3184
	20:2546	LA–12855-MS
	20:2547	LA–12856-MS
W-7405-ENG-48	**Sandia National Labs., Livermore, CA (United States)**	
	20:2341	SAND–95-8424C
	Lawrence Livermore National Lab., CA (United States)	
	20:141	UCRL-JC–115758
	20:320	UCRL-JC–115352
	20:321	UCRL-JC–116202
	20:322	UCRL-JC–116431
	20:515	UCRL-ID–113867-94
	20:516	UCRL-ID–116220
	20:562	UCRL-ID–106454-94-3
	20:713	UCRL-JC–117285
	20:1004	UCRL-JC–117602
	20:1053	UCRL-JC–115809

Contract No.	Abstract No.	Report No.
	20:1098	UCRL-LR–114070-6
	20:1099	UCRL-ID–117293
	20:1336	UCRL-JC–116407
	20:1451	UCRL-JC–117078
	20:1452	UCRL-JC–117820
	20:1510	UCRL-JC–116774
	20:1511	UCRL-JC–116930
	20:1675	UCRL-JC–116176-Rev.1
	20:1690	CONF-9309103–Vol.1
	20:1691	CONF-9309103–Vol.2
	20:1700	UCRL-CR–118446
	20:1770	UCRL-ID–118059
	20:1839	UCRL-JC–118432
	20:1973	UCRL-CR–117756
	20:1974	UCRL-JC–115131
	20:2342	UCRL-JC–117613
	20:2387	UCRL-JC–118407
	20:2427	UCRL-ID–116263
	20:2447	UCRL-JC–118161
	20:2560	UCRL-JC–115854
	20:2561	UCRL-JC–116231-Rev.1
	20:2562	UCRL-JC–116963
	20:2563	UCRL-JC–117547
	20:2564	UCRL-JC–117548
	20:2565	UCRL-JC–118154
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Industrial and Medical Nuclear Safety	
	20:1442	NUREG/CR–5403
W-7405-ENG-82	**Ames Lab., IA (United States)**	
	20:48	IS-M–798
	20:49	IS-M–799
	20:71	IS-M–804
	20:1143	IS-M–795
	20:1144	IS-M–796
	20:1145	IS-T–1538
	20:1146	IS-T–1689
	20:1280	IS-M–806
	20:1329	IS-T–1712
	20:1363	IS-T–1698
	20:2294	IS-T–1709
	Iowa State Univ. of Science and Technology, Ames, IA (United States)	
	20:1232	IS-M–803
	20:1233	IS-T–1621
	20:1327	IS-T–1696
	20:1328	IS-T–1701
	20:1364	IS-T–1699
	20:1370	IS-T–1713
	20:1865	IS-T–1710
	20:2384	IS-M–797
	Oak Ridge National Lab., TN (United States)	
	20:1174	CONF-9410165–8
	Nuclear Regulatory Commission, Washington, DC (United States). Div. of Engineering	
	20:879	NUREG/CR–6161

Report Number Index

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Report Number	*Abstract Number*	*Source of Availability*	*GPO Dep.*	*Order Number*	*Distribution Category*
AAEC/E–					
242	20:832	OSTI; NTIS (US Sales Only); INIS		DE95606172	
ABB-ATOM-SDB–					
93-1288(rev.)	20:215	OSTI; NTIS; INIS		DE95606775	
ACT–					
10/93.	20:2062	*See* LAPP-A–427-93			
ANL–					
94/19	20:216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017954	MF-2000
94/31	20:2201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003098	PC-410
ANL-HEP-TR–					
94-57	20:2030	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001471	MF-414
ANL/CHM/CP–					
81118	20:1291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001507	MF-401; MF-411
ANL/CMT/CP–					
84205	20:1006	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001455	MF-110
ANL/CMT/PP–					
78044	20:217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002901	MF-2020
ANL/DIS/CP–					
84102	20:985	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001098	MF-1322
ANL/EA/CP–					
84264	20:1773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001444	
ANL/EAD/LD–					
2	20:218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015594	MF-630; MF-902
ANL/EAD/TM–					
24	20:1906	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003096	MF-902
ANL/ER/CP–					
82594	20:717	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001126	MF-400
ANL/ES/CP–					
82394	20:1072	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001119	MF-1500
82395	20:1073	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001102	MF-1501
ANL/ESD–					
24	20:59	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001851	MF-109
ANL/ESD/TM–					
75	20:734	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003029	MF-1418
76	20:997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002578	MF-920
ANL/ET/CP–					
81606	20:1100	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002907	MF-424
82313	20:1478	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002909	MF-1394
82340	20:1168	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001470	MF-1394; MF-404
83175	20:219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002904	MF-2020
83313	20:1169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015028	MF-900
83730	20:134	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002908	MF-1406

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
84257	20:839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001446	MF-520
ANL/ET/RP–					
83893	20:924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001449	MF-404; MF-504; MF-510; MF-1406
ANL/IPNS/PP–					
79589	20:1239	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001457	MF-404
ANL/MCS/CP–					
84282	20:2524	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001472	MF-405
84283	20:2525	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001845	MF-405
ANL/MCS/PP–					
71694	20:2346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001456	MF-405
72994	20:2526	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001450	MF-405
73221	20:1863	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002924	MF-405
75185	20:2527	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002917	MF-405
75731	20:2528	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002918	MF-405
76460	20:2529	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002919	MF-405
77544	20:2530	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002921	MF-405
ANL/RE/CP–					
80730	20:820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001430	MF-506
ANL/RE/PP–					
79448	20:220	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016896	MF-506
ANL/TD/CP–					
82768	20:1871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001445	
83926	20:2429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018369	MF-424
83927	20:2430	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018370	MF-424
ANSTO/E–					
708	20:1702	OSTI; NTIS (US Sales Only); INIS		DE95606034	
709	20:1703	OSTI; NTIS (US Sales Only); INIS		DE95606035	
AREAEE–					
282	20:1479	OSTI; NTIS (US Sales Only); INIS		DE95603850	
283	20:795	OSTI; NTIS (US Sales Only); INIS		DE95606833	
284	20:1907	OSTI; NTIS (US Sales Only); INIS		DE95606182	
285	20:804	OSTI; NTIS (US Sales Only); INIS		DE95606473	
286	20:1480	OSTI; NTIS (US Sales Only); INIS		DE95606433	
287	20:805	OSTI; NTIS (US Sales Only); INIS		DE95606474	
288	20:159	OSTI; NTIS (US Sales Only); INIS		DE95605747	
289	20:2399	OSTI; NTIS (US Sales Only); INIS		DE95607623	
290	20:833	OSTI; NTIS (US Sales Only); INIS		DE95606168	
291	20:160	OSTI; NTIS (US Sales Only); INIS		DE95605748	
292	20:2287	OSTI; NTIS (US Sales Only); INIS		DE95607536	
294	20:2400	OSTI; NTIS (US Sales Only); INIS		DE95607648	
295	20:1409	OSTI; NTIS (US Sales Only); INIS		DE95605678	
296	20:1615	OSTI; NTIS (US Sales Only); INIS		DE95606664	
297	20:2401	OSTI; NTIS (US Sales Only); INIS		DE95607624	
300	20:161	OSTI; NTIS (US Sales Only); INIS		DE95605749	
301	20:162	OSTI; NTIS (US Sales Only); INIS		DE95605750	
302	20:840	OSTI; NTIS (US Sales Only); INIS		DE95606626	
303	20:821	OSTI; NTIS (US Sales Only); INIS		DE95606502	
304	20:146	OSTI; NTIS (US Sales Only); INIS		DE95605746	
305	20:1292	OSTI; NTIS (US Sales Only); INIS		DE95605544	
306	20:1339	OSTI; NTIS (US Sales Only); INIS		DE95605635	
307	20:768	OSTI; NTIS (US Sales Only); INIS		DE95606594	
308	20:1101	OSTI; NTIS (US Sales Only); INIS		DE95605761	
309	20:1102	OSTI; NTIS (US Sales Only); INIS		DE95605762	
310	20:2224	OSTI; NTIS (US Sales Only); INIS		DE95607359	
312	20:1513	OSTI; NTIS (US Sales Only); INIS		DE95606415	
313	20:2531	OSTI; NTIS (US Sales Only); INIS		DE95606978	
315	20:1377	OSTI; NTIS (US Sales Only); INIS		DE95605727	
BNL–					
47476	20:1541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002222	MF-406
52424-Rev.9/94	20:1542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002657	PC-414
52436	20:240	*See* DOE/MWIP–30			
52439	20:1527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002656	PC-414
60093	20:1514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002224	MF-414
60533	20:895	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002172	MF-404
60553	20:1543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002226	MF-414
60655	20:2532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002225	MF-414
60774	20:1515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002174	MF-411

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
60785	20:2203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002173	MF-413
60796	20:2204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002171	MF-413
60807	20:2205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002179	MF-413
60808	20:2206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002175	MF-413
60809	20:2233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002177	MF-414
60826	20:1516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002170	MF-414
60827	20:1517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002176	MF-411
60834	20:1872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000762	MF-408
60862	20:1528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002450	MF-414
60874	20:1544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002410	MF-414
60876	20:1529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002227	MF-410
60878	20:1530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002515	MF-414
60892	20:1663	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002416	MF-406
60900	20:2308	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002465	MF-406
60902	20:1428	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002927	MF-406
60903	20:2309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002409	MF-410
60905	20:1616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002466	MF-414
60907	20:1545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002514	MF-414
60923	20:2234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002229	MF-413
60926	20:1546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002518	MF-414
60930	20:1013	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002223	MF-1600
60934	20:2310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002419	MF-410
60935	20:1617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002418	MF-414
60952	20:1340	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001994	MF-401
BNL-NUREG–					
52390	20:878	*See* NUREG/CR–6087			
52391	20:830	*See* NUREG/CR–6105			
52400	20:831	*See* NUREG/CR–6146			
60392	20:871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018671	
BNWL-CC–					
1378	20:633	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016941	MF-500
608	20:822	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001342	MF-500
979	20:834	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016508	MF-500
BNWL-SA–					
3045	20:447	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001345	MF-500
3047	20:1908	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001337	MF-502
3583	20:448	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001333	MF-500
3585	20:637	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001331	MF-502
5493	20:835	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001328	MF-502
BONN-IB–					
94-03	20:2185	OSTI; NTIS (US Sales Only); INIS		DE95711495	
BULLETIN/Y–					
232	20:1051	*See* TVA/NFERC–93/4			
233	20:1870	*See* TVA/NFERC–93/7			
234	20:1052	*See* TVA/NFERC–93/6			
235	20:1369	*See* TVA/NFERC–94/1			
BUTP–					
93/19.	20:2091	*See* IPNO-TH–93-37			
CBP–					
103	20:1524	*See* LBL–36110			
CEA-CONF–					
11782	20:1462	OSTI; NTIS (US Sales Only); INIS		DE95606390	
11783	20:789	OSTI; NTIS (US Sales Only); INIS		DE95606614	
11785	20:769	OSTI; NTIS (US Sales Only); INIS		DE95606595	
11786	20:814	OSTI; NTIS (US Sales Only); INIS		DE95606494	
11787	20:221	OSTI; NTIS (US Sales Only); INIS		DE95606783	
11790	20:147	OSTI; NTIS (US Sales Only); INIS		DE95606366	
11791	20:741	OSTI; NTIS (US Sales Only); INIS		DE95606749	
11792	20:755	OSTI; NTIS (US Sales Only); INIS		DE95606535	
11793	20:187	OSTI; NTIS (US Sales Only); INIS		DE95606399	
11794	20:1481	OSTI; NTIS (US Sales Only); INIS		DE95606434	
11795	20:1463	OSTI; NTIS (US Sales Only); INIS		DE95606391	
11799	20:756	OSTI; NTIS (US Sales Only); INIS		DE95606539	
11800	20:222	OSTI; NTIS (US Sales Only); INIS		DE95606776	
11801	20:163	OSTI; NTIS (US Sales Only); INIS		DE95605751	
11802	20:164	OSTI; NTIS (US Sales Only); INIS		DE95605752	
11803	20:823	OSTI; NTIS (US Sales Only); INIS		DE95606503	
11804	20:824	OSTI; NTIS (US Sales Only); INIS		DE95606504	
11806	20:148	OSTI; NTIS (US Sales Only); INIS		DE95606367	
11809	20:188	OSTI; NTIS (US Sales Only); INIS		DE95606400	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
11810	20:1909	OSTI; NTIS (US Sales Only); INIS		DE95606174	
11814	20:1774	OSTI; NTIS (US Sales Only); INIS		DE95605958	
11830	20:757	OSTI; NTIS (US Sales Only); INIS		DE95606542	
11831	20:758	OSTI; NTIS (US Sales Only); INIS		DE95606543	
11832	20:759	OSTI; NTIS (US Sales Only); INIS		DE95606544	
11833	20:760	OSTI; NTIS (US Sales Only); INIS		DE95606545	
11834	20:1464	OSTI; NTIS (US Sales Only); INIS		DE95606392	
11835	20:790	OSTI; NTIS (US Sales Only); INIS		DE95606615	
11837	20:761	OSTI; NTIS (US Sales Only); INIS		DE95606547	
11839	20:1465	OSTI; NTIS (US Sales Only); INIS		DE95606393	
11841	20:748	OSTI; NTIS (US Sales Only); INIS		DE95606519	
CEA-DAPNIA-SPP–					
93-22	20:2031	OSTI; NTIS (US Sales Only); INIS		DE95607110	
CEA-LNS-GT-ME–					
92-01	20:1518	OSTI; NTIS (US Sales Only); INIS		DE95606416	
92-02	20:1519	OSTI; NTIS (US Sales Only); INIS		DE95606417	
CEA-N–					
2739	20:2402	OSTI; NTIS (US Sales Only); INIS		DE95607642	
CEND–					
432	20:762	*See* DOE/ET/34013–15			
CERN–					
94-02	20:1531	OSTI; NTIS (US Sales Only); INIS		DE95603831	
94-03	20:1547	OSTI; NTIS (US Sales Only); INIS		DE95606427	
CERN-TH–					
6854/93.	20:2061	*See* LAPP-A–424-93			
6897/93	20:2062	*See* LAPP-A–427-93			
7339/94.	20:2158	*See* IC–94/154			
CONF-630922–		(International Atomic Energy Agency symposium on exponetial and critical experiments; Amsterdam (Netherlands); 2-6 Sep 1963)			
1	20:859	*See* HW-SA–2984			
CONF-8210113–		(American Physical Society meeting on particles and fields; College Park, MD (United States); 28-30 Oct 1982)			
4	20:2148	*See* DOE/ER/02504–391			
CONF-8512135–		(Advances in technology for the construction of deep-underground facilities conference; Reston, VA (United States); 12-14 Dec 1985)			
Summ.	20:1677	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015607	MF-406
CONF-880010–		(International conference on geochemical evolution of the continental crust; Poco de Caldas (Brazil); 1988)			
	20:143	*See* INIS-BR–3444			
	20:1301	*See* INIS-BR–3443			
CONF-880118–		(12. annual conference on composites and advanced ceramic materials; Cocoa Beach, FL (United States); 20-22 Jan 1988)			
1	20:1170	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001989	MF-404
CONF-880760–		(15. annual review of progress in quantitative nondestructive evaluation; La Jolla, CA (United States); 31 Jul - 5 aug 1988)			
13	20:1497	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002124	MF-404
CONF-890130–		(13. annual conference on composites and advanced ceramics; Cocoa Beach, FL (United States); 15-18 Jan 1989)			
5	20:1171	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001990	MF-404
CONF-8910122–		(International congress on forest decline research: state of knowledge and perspectives; Friedrichshafen (Germany); 2-6 Oct 1989)			
	20:1950	*See* INIS-mf–15063			
	20:1952	*See* INIS-mf–15065			
CONF-9004375–		(3. Nuclear Science and Technology Conference; Bangkok (Thailand); 23-25 Apr 1990)			
	20:1380	*See* INIS-mf–14340			
CONF-9103289–		(Conference on energy supply on community level between communal and external supply concepts; Leipzig (Germany); 25 Mar 1991)			
	20:1056	OSTI; NTIS (US Sales Only)		DE95708743	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9105455–		(Compost preparation of agricultural and non-agricultural organic recyclings seminar; Weihenstephan (Germany); 16 May 1991)			
	20:1057	OSTI; NTIS (US Sales Only)		DE95708673	
CONF-9108101–		(4. chemical congress of North America; 206. American Chemical Society (ACS) national meeting; New York, NY (United States); Chicago, IL (United States); 25-30 Aug 1991; 22-27 aug 1993)			
4	20:1775	OSTI; NTIS		DE95001732	
CONF-9108260–		(9. deformation and fracture symposium; Magdeburg (Germany); 28-30 Aug 1991)			
1	20:1103	OSTI; NTIS (US Sales Only)		DE95708672	
CONF-9109397–		(GET/ETG meeting on combustion and heating - 15th German flame day; Bochum (Germany); 17-18 Sep 1991)			
1	20:1014	OSTI; NTIS (US Sales Only)		DE95708622	
CONF-9110540–		(Workshop on establishing instiutional credibility for SEAB task force on radioactive waste management; Denver, CO (United States); 24-25 Oct 1991)			
Summ.	20:906	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001012	MF-400
CONF-9111345–		(ASEW seminar: Energy conservation at the customer's - financial support models of municipal utility companies; Hannover (Germany); 19 Nov 1991)			
	20:971	OSTI; NTIS (US Sales Only)		DE95711811	
CONF-911202–		(Annual fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 2-6 Dec 1991)			
90	20:2311	*See* DOE/ER/13506–52			
CONF-9202140–		(6. European symposium on semiconductor detectors: new developments on radiation detectors; Milan (Italy); 24-26 Feb 1992)			
2	20:1617	*See* BNL–60935			
CONF-920307–		(Waste management '92; Tucson, AZ (United States); 1-5 Mar 1992)			
103	20:520	*See* WHC-SA–1455			
CONF-9205419–		(60. IFA annual conference; Seoul (Korea, Republic of); 25-29 May 1992)			
1	20:1776	OSTI; NTIS		DE95001734	
CONF-9208255–		(Workshop on general circulation model study: climate-chemistry interactions; Workshop on general circulation model study: climate-chemistry interactions; Oslo (Norway); Albany, NY (United States); 19-21 Aug 1992; 26-27 may 1993)			
Summ.	20:1709	*See* DOE/ER/61447–1			
CONF-9209295–		(Society of Photo Optical Instrumentation Engineers (SPIE/EOS) international symposium on optical design systems; Berlin (Germany); 14-19 Sep 1992)			
3	20:1541	*See* BNL–47476			
CONF-9209481–		(Small energy projects in developing countries - identification, evaluation and planning of projects meeting; Bremen (Germany); 24-25 Sep 1992)			
	20:910	*See* INIS-mf–15039			
CONF-9210482–		(International seminar on the chemistry of high energy atoms; Tokyo (Japan); 28-30 Oct 1992)			
	20:1411	*See* IAERU–9304			
CONF-921104–		(American Institute of Chemical Engineers annual meeting; Miami, FL (United States); 1-6 Nov 1992)			
16	20:695	OSTI; NTIS; INIS		DE95001729	
CONF-9211327–		(Meeting on e+ e- collisions at 500 GeV: the physics potential; Munich (Germany); 20 Nov 1992)			
	20:2100	*See* DESY–93-123C			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9301152–		(Colloquium held in honour of Alfred Schatz on the occasion of his 65th anniversary; Stuttgart (Germany); 15 Jan 1993)			
	20:2451	*See* IKE–4-137			
CONF-930168–		(Simulating accelerator radiation environments workshop; Santa Fe, NM (United States); 11-15 Jan 1993)			
	20:1521	*See* LA–12835-C			
CONF-9302194–		(IAEA experts' meeting on recommendations on management of radioactive wastes from WWER; Sofia (Bulgaria); 23-26 Feb 1993)			
	20:277	*See* INIS-mf–14347			
	20:278	*See* INIS-mf–14348			
	20:279	*See* INIS-mf–14349			
	20:280	*See* INIS-mf–14350			
	20:281	*See* INIS-mf–14351			
	20:282	*See* INIS-mf–14352			
CONF-9302195–		(IAEA review meeting on training for the qualification and competence of nuclear power plant personnel; Vienna (Austria); 22-26 Feb 1993)			
	20:827	*See* IAEA/NENP/TC–93/1			
CONF-9302201–		(J.A. Swieca summer school; Sao Paulo (Brazil); 1-6 Feb 1993)			
	20:2213	*See* IPNO-TH–93-07			
CONF-930319–		(International conference on nuclear and particle physics; Glasgow (United Kingdom); 30 Mar - 1 apr 1993)			
	20:2214	*See* IPNO-TH–93-14			
CONF-9303194–		(Meeting on Protection, Handling, Detection and Safety; Strasbourg (France); 30 Mar - 1 apr 1993)			
	20:187	*See* CEA-CONF–11793			
	20:741	*See* CEA-CONF–11791			
CONF-9303310–		(EPRI PCB biotransformation project collaborators meeting; Chattanooga, TN (United States); 30 Mar 1993)			
1	20:1777	OSTI; NTIS		DE95001730	
CONF-9303314–		(Technical committee meeting on away-from-reactor storage concepts and their implementation; Vienna (Austria); 15-18 Mar 1993)			
	20:192	*See* IAEA-TECDOC–759			
CONF-9303315–		(Workshop on Pressure Vessel Surveillance Programmes and their Applications; Prague (Czech Republic); 16-18 Mar 1993)			
	20:755	*See* CEA-CONF–11792			
CONF-9303316–		(First Workshop on Design and Construction of Deep Repositories - Theme: Excavation through water-conducting major fracture zones; Saastaholm (Sweden); 30-31 Mar 1993)			
	20:319	*See* SKB-TR–94-06			
CONF-9304232–		(2. international workshop on physics and experiments with linear e+e- colliders; Waikoloa, KO (United States); 26-3 Apr 1993)			
	20:2176	*See* LAL–93-38			
CONF-9304267–		(3. EC blanket/structural materials meeting; Petten (Netherlands); 29 Apr 1993)			
	20:1113	*See* ECN-RX–93-082			
CONF-930511–		(PAC '93: international particle accelerator conference; Washington, DC (United States); 17-20 May 1993)			
521	20:1595	*See* SLAC-PUB–6690			
522	20:1514	*See* BNL–60093			
CONF-930534–		(3. international conference on radioactive nuclear beams; East Lansing, MI (United States); 24-27 May 1993)			
	20:1520	*See* IPNO-DRE–93-16			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9305343–		(Workshop on general circulation model study: climate-chemistry interactions; Workshop on general circulation model study: climate-chemistry interactions; Oslo (Norway); Albany, NY (United States); 19-21 Aug 1992; 26-27 may 1993)			
Summ.	20:1709	*See* DOE/ER/61447–1			
CONF-9305386–		(Workshop on Δ excitation in nuclei; Riken (Japan); 27-29 May 1993)			
	20:2249	*See* IPNO-DRE–93-33			
CONF-9306148–		(Coal-fired power systems '93: advances in IGCC and PFBC review meeting; Morgantown, WV (United States); 28-30 Jun 1993)			
49	20:6	OSTI; NTIS; GPO Dep.	E 1.99:	DE93000299	MF-106
CONF-9306258–		(Workshop on B physics at hadron accelerators; Snowmass, CO (United States); 21 Jun - 2 jul 1993)			
	20:2031	*See* CEA-DAPNIA-SPP–93-22			
CONF-9306276–		(3. international workshop on a tau-charm factory; Marbella (Spain); 1-6 Jun 1993)			
	20:2195	*See* IPNO-TH–93-38			
CONF-9306316–		(Conference on polyatomic ion impact on solids and related phenomena; Saint-Malo (France); 6-10 Jun 1993)			
	20:2359	*See* IPNO-DRE–93-25			
CONF-9306383–		(Nuclear energy and natural environment; Jadwisin (Poland); 22-23 Jun 1993)			
	20:587	*See* INIS-mf–14392			
CONF-9306384–		(ECC workgroup meeting on hot cells; Chinon (France); 15-16 Jun 1993)			
	20:1481	*See* CEA-CONF–11794			
CONF-9307153–		(NATO Advanced Study Institute on vortices in superconductors; Cargese (France); 19-31 Jul 1993)			
1	20:2309	*See* BNL–60903			
CONF-9307163–		(1. international conference on large scale applications and radiation hardness of semiconductor detectors; Florence (Italy); 7-9 Jul 1993)			
4	20:1616	*See* BNL–60905			
CONF-930722–		(Annual meeting of the Society of Photo-Optical Instrumentation Engineers (SPIE); San Diego, CA (United States); 11-16 Jul 1993)			
61	20:2308	*See* BNL–60900			
CONF-930767–		(21. annual SLAC Summer Institute on particle physics: spin structure in high-energy processes; Stanford, CA (United States); 26 Jul - 6 aug 1993)			
	20:2147	*See* DESY–94-137			
CONF-930802–		(206. American Chemical Society (ACS) national meeting; Chicago, IL (United States); 22-27 Aug 1993)			
17	20:1035	OSTI; NTIS; INIS		DE95001716	
18	20:1371	OSTI; NTIS		DE95001725	
20	20:1775	*See* CONF-9108101–4			
21	20:1104	OSTI; NTIS		DE95001714	
22	20:1105	OSTI; NTIS		DE95001715	
CONF-930809–		(8. ASTM-EURATOM symposium on reactor dosimetry; Vail, CO (United States); 29 Aug - 3 sep 1993)			
	20:756	*See* CEA-CONF–11799			
	20:824	*See* CEA-CONF–11804			
CONF-9308249–		(Workshop on climate database systems; Hamburg (Germany); 30 Aug - 2 sep 1993)			
	20:2567	*See* DKRZ-TR–8			
CONF-9308250–		(American Chemical Society national meeting on fertilizer and soil chemistry/specialty fertilizers; Washington, DC (United States); 23-27 Aug 1993)			
1	20:1844	OSTI; NTIS		DE95001726	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-930830–		(National conference and exposition on heat transfer; Atlanta, GA (United States); 8-11 Aug 1993)			
	20:1463	*See* CEA-CONF–11795			
CONF-930867–		(Gull Lake nuclear physics conference on giant resonances; Gull Lake, MI (United States); 17-21 Aug 1993)			
	20:2209	*See* IPNO-DRE–93-22			
	20:2211	*See* IPNO-DRE–93-24			
CONF-930906–		('93 international conference on nuclear waste management and environmental remediation; Prague (Czech Republic); 5-11 Sep 1993)			
21	20:1843	*See* WHC-SA–1937			
CONF-9309103–		(7. symposium on containment of underground nuclear explosions; Kent, WA (United States); 13-17 Sep 1993)			
Vol.1	20:1690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001257	MF-703
Vol.2	20:1691	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001250	MF-703
CONF-9309146–		(5. annual American Chemical Society (ACS) Industrial and Engineering Chemistry (I&EC) Division special symposium on emerging technologies for hazardous waste management; Atlanta, GA (United States); 27-29 Sep 1993)			
9	20:1036	OSTI; NTIS		DE95001733	
10	20:1372	OSTI; NTIS		DE95001731	
CONF-9309287–		(4. French congress on process engineering; Grenoble (France); 21-23 Sep 1993)			
	20:163	*See* CEA-CONF–11801			
	20:164	*See* CEA-CONF–11802			
	20:222	*See* CEA-CONF–11800			
CONF-9309292–		(Advanced study conference on heavy flavours; Pavia (Italy); 3-7 Sep 1993)			
	20:2177	*See* LAPP-EXP–94-03			
CONF-9309342–		(EUROCOURSE on environmental cleanup; Ispra (Italy); 13-17 Sep 1993)			
2	20:1053	*See* UCRL-JC–115809			
CONF-9309380–		(A seminar on physics and technology of nuclear reactors; Cairo (Egypt); 11 Sep 1993)			
	20:861	*See* INIS-mf–14313			
CONF-9309439–		(3. Meeting of the International Group on Research Reactors; Naka-Machi (Japan); 30 Sep - 1 oct 1993)			
	20:823	*See* CEA-CONF–11803			
CONF-930999–		(NATO Advanced Study Institute on hot and dense nuclear matter; Bodrum (Turkey); 26 Sep - 9 oct 1993)			
	20:2247	*See* IPNO-DRE–93-30			
CONF-931005–		(6. international topical meeting on nuclear reactor thermal hydraulics; Grenoble (France); 5-8 Oct 1993)			
	20:748	*See* CEA-CONF–11841			
	20:757	*See* CEA-CONF–11830			
	20:758	*See* CEA-CONF–11831			
	20:759	*See* CEA-CONF–11832			
	20:760	*See* CEA-CONF–11833			
	20:761	*See* CEA-CONF–11837			
	20:790	*See* CEA-CONF–11835			
	20:1464	*See* CEA-CONF–11834			
	20:1465	*See* CEA-CONF–11839			
CONF-9310102–		(4. energy natural phenomena hazards mitigation conference; Atlanta, GA (United States); 19-22 Oct 1993)			
48	20:332	*See* WHC-SA–1884			
49	20:544	*See* Y/EN–4688			
CONF-9310172–		(International logic programming symposium; Vancouver (Canada); 26-29 Oct 1993)			
	20:943	*See* INIS-mf–13988			
	20:944	*See* INIS-mf–13989			
	20:945	*See* INIS-mf–13990			
	20:946	*See* INIS-mf–13991			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
	20:947	*See* INIS-mf–13992			
	20:948	*See* INIS-mf–13993			
CONF-9310209–		(1993 Fusion Power Associates annual meeting; Oak Ridge, TN (United States); 4-6 Oct 1993)			
2	20:1498	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001419	MF-700
CONF-9310373–		(IAEA technical co-operation meeting on training-related activities for nuclear power plant personnel in the countries of Central and Eastern Europe and the former Soviet Union; Vienna (Austria); 11-15 Oct 1993)			
	20:828	*See* IAEA/NENP/TC–93/2			
CONF-9310374–		(National Information Infrastructure (NII) education forum; Arlington, VA (United States); 6-8 Oct 1993)			
Summ.	20:930	*See* ORNL/TM–12671			
CONF-9310377–		(Advanced topics in risk and reliability analysis; Annapolis, MD (United States); 20 Oct 1993)			
	20:874	*See* NUREG/CP–0138			
CONF-9310378–		(Oklo Working Group Meeting; Bruxelles (Belgium); 11-12 Oct 1993)			
	20:1774	*See* CEA-CONF–11814			
CONF-9310380–		(Workshop on beam cooling and related topics; Montreux (Switzerland); 4-8 Oct 1993)			
	20:1547	*See* CERN–94-03			
CONF-9310381–		(SCIFI 93: Workshop on scintillating fibre detectors; Notre Dame, IN (United States); 24-28 Oct 1993)			
	20:1647	*See* LAPP-EXP–94-04			
	20:1648	*See* LAPP-EXP–94-05			
CONF-9311131–		(22. international thermal conductivity conference; Tempe, AZ (United States); 7-10 Nov 1993)			
6	20:1026	*See* LBL–36134			
CONF-9311249–		(National roundtable of state pollution prevention programs; Nashville, TN (United States); 2-5 Nov 1993)			
1	20:1704	OSTI; NTIS		DE95001735	
CONF-9311250–		(Regional seminar on nuclear energy, a new energy for development; Shanghai (China); 1-3 Nov 1993)			
	20:949	*See* INIS-mf–13994			
	20:950	*See* INIS-mf–13995			
	20:951	*See* INIS-mf–13996			
	20:952	*See* INIS-mf–13997			
	20:953	*See* INIS-mf–13998			
	20:954	*See* INIS-mf–13999			
	20:955	*See* INIS-mf–14301			
	20:956	*See* INIS-mf–14302			
	20:957	*See* INIS-mf–14303			
	20:958	*See* INIS-mf–14304			
	20:959	*See* INIS-mf–14305			
	20:960	*See* INIS-mf–14306			
	20:961	*See* INIS-mf–14307			
CONF-9311255–		(4. international TEAM workshop; Miami, FL (United States); 5-6 Nov 1993)			
1	20:2524	*See* ANL/MCS/CP–84282			
CONF-931181–		(Eastern oil shale symposium; Lexington, KY (United States); 17-19 Nov 1993)			
2	20:141	*See* UCRL-JC–115758			
CONF-931290–		(12. Brazilian congress on mechanical engineering; Brasilia (Brazil); 7-10 Dec 1993)			
	20:1552	*See* INIS-BR–3446			
CONF-931292–		(Conference on practical thresholds in radiation protection; Saclay (France); 7-8 Dec 1993)			
	20:1909	*See* CEA-CONF–11810			
CONF-940104–		(Winter meeting of the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE); New Orleans, LA (United States); 22-26 Jan 1994)			
12-Pt.2	20:1022	*See* LBL–34716			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-940135–		(18. annual conference on composites and advanced ceramics; Cocoa Beach, FL (United States); 9-14 Jan 1994)			
9	20:725	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017769	
CONF-940152–		(32. aerospace sciences meeting and exhibit; Reno, NV (United States); 11-14 Jan 1994)			
3	20:1476	*See* LA-UR–94-3611			
CONF-940204–		(123. annual meeting of the Minerals, Metals and Materials Society; San Francisco, CA (United States); 27 Feb - 3 mar 1994)			
11	20:318	*See* SAND–94-2759C			
CONF-9402109–		(Workshop on nuclear power and energy planning; Colombo (Sri Lanka); 16-18 Feb 1994)			
	20:636	*See* INIS-mf–14366			
	20:798	*See* INIS-mf–14369			
	20:799	*See* INIS-mf–14372			
	20:891	*See* INIS-mf–14367			
	20:892	*See* INIS-mf–14371			
	20:909	*See* INIS-mf–14368			
	20:962	*See* INIS-mf–14370			
CONF-9402113–		(International Nuclear Fuel Seminar; Saclay (France); 7-18 Feb 1994)			
	20:147	*See* CEA-CONF–11790			
CONF-940216–		(Nondestructive assay and nondestructive examination waste chracterization conference; Pocatello, ID (United States); 14-16 Feb 1994)			
6	20:255	*See* EGG-M–94237			
CONF-940225–		(Waste management '94; Tucson, AZ (United States); 27 Feb - 3 mar 1994)			
121	20:223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017705	MF-2010
123	20:224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017866	MF-2010
125	20:933	*See* PNL-SA–23687			
CONF-940261–		(ISAC workshop; Lake Louise (Canada); 17-21 Feb 1994)			
2	20:1606	*See* LBL–36064			
CONF-940301–		(207. spring national meeting of the American Chemical Society (ACS); San Diego, CA (United States); 13-18 Mar 1994)			
44	20:503	*See* LA-UR–94-3373			
CONF-9403135–		(International symposium on frontiers of nuclear structure physics; Tokyo (Japan); 2-5 Mar 1994)			
2	20:2203	*See* BNL–60785			
CONF-9403170–		(1995 American Society of Mechanical Engineers/Japanese Society of Mechanical Engineers/Japan Solar Energy Society (ASME/JSME/JSES) international solar energy conference; Maui, HI (United States); 19-24 Mar 1994)			
1	20:706	*See* SAND–94-1245C			
CONF-940327–		(29. Moriond meeting on quantum chromodynamics and high energy hadronic interactions; Les Arcs (France); 12-26 Mar 1994)			
13	20:2237	*See* FNAL/C–94/219-E			
CONF-940406–		(International symposium on decontamination and decommissioning; Knoxville, TN (United States); 27-29 Apr 1994)			
16	20:225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017872	MF-511
CONF-940412–		(12. geothermal program review: geothermal's role in global climate change - impacts on the Climate Change Action Plan; San Francisco, CA (United States); 25-28 Apr 1994)			
7	20:713	*See* UCRL-JC–117285			
CONF-940411–		(Spring meeting of the Materials Research Society; San Francisco, CA (United States); 4-8 Apr 1994)			
55	20:1172	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001351	MF-1500

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9404131–		(American Society for Precision Engineering (ASPE) conference; Tucson, AZ (United States); 6-8 Apr 1994)			
3	20:1511	*See* UCRL-JC–116930			
CONF-9404137–		(12. symposium on energy engineering sciences; Argonne, IL (United States); 27-29 Apr 1994)			
	20:1466	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017694	MF-400
CONF-9404215–		(Mathematics and computations, reactor physics, and environmental analysis; Portland, OR (United States); 30 Apr - 4 may 1994)			
1	20:1650	*See* LA-UR–94-3244			
CONF-9404216–		(21. annual National Organization for the Professional Advancement of Black Chemists and Chemical Engineering meeting; Atlantic City, NJ (United States); 5 Apr 1994)			
1	20:1869	*See* LA-UR–94-3160			
CONF-9404219–		(51. (spring 1994) meeting on cryogenics and superconductivity; Yokohama (Japan); 25-27 Apr 1994)			
	20:1074	OSTI; NTIS; Available from Cryogenic Society of Japan, 12-8, Hongo 6-chome, Bunkyo-ku, Tokyo, Japan		DE95714332	
CONF-940424–		(8. international conference on radiation shielding; Arlington, TX (United States); 24-27 Apr 1994)			
	20:188	*See* CEA-CONF–11809			
	20:221	*See* CEA-CONF–11787			
	20:769	*See* CEA-CONF–11785			
	20:814	*See* CEA-CONF–11786			
CONF-940440–		(International conference on metallurgical coatings and thin films; San Diego, CA (United States); 25-29 Apr 1994)			
6	20:1291	*See* ANL/CHM/CP–81118			
CONF-940442–		(Conference on the management of high sulfur coal combustion residues: issues and practices; Springfield, IL (United States); 5-7 Apr 1994)			
	20:79	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001292	MF-104
CONF-940445–		(56. annual American power conference; Chicago, IL (United States); 25-27 Apr 1994)			
8	20:820	*See* ANL/RE/CP–80730			
CONF-940509–		(Conference on nucleus-nucleus collisions; Catania (Italy); 30 May - 4 jun 1994)			
6	20:2271	*See* LBL–36105			
7	20:2178	*See* LBL–36033			
CONF-9405109–		(Department of Energy defense programs packaging workshop; Knoxville, TN (United States); 16-19 May 1994)			
11	20:1429	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017749	MF-400
CONF-9405187–		(5. international symposium on ceramic materials and components for engines; Shanghai (China); 29 May - 1 jun 1994)			
3	20:1173	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001425	MF-1505
CONF-9405206–		(Workshop on low slope re-roofing: a review of alternatives; Oak Ridge, TN (United States); 24-25 May 1994)			
	20:1430	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019240	MF-1600
CONF-9405240–		(Non-linear exitations in biomolecules; Houches (France); 30 May - 4 jun 1994)			
1	20:1867	*See* LA-UR–94-3138			
2	20:1868	*See* LA-UR–94-3139			
CONF-9405247–		(Harmony of physics conference; Philadelphia, PA (United States); 8-9 May 1994)			
1	20:2204	*See* BNL–60796			
CONF-940529–		(185. Electrochemical Society meeting; San Francisco, CA (United States); 22-27 May 1994)			
26	20:1373	*See* DOE/ER/00038–3707			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-940553–		(International high-level radioactive waste management conference; Las Vegas, NV (United States); 22-26 May 1994)			
82	20:320	*See* UCRL-JC–115352			
CONF-940571–		(Networld + interop '94 engineer's conference; Las Vegas, NV (United States); 2-6 May 1994)			
2	20:226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017755	MF-800
CONF-940592–		(4. international colloquium on X-ray lasers; Williamsburg, VA (United States); 16-20 May 1994)			
8	20:1510	*See* UCRL-JC–116774			
9	20:1526	*See* SLAC-PUB–6449			
CONF-940602–		(35. annual meeting of the American Nuclear Society; New Orleans, LA (United States); 11-16 Jun 1994)			
20	20:333	*See* WHC-SA–2302			
21	20:321	*See* UCRL-JC–116202			
CONF-940613–		(1994 pressure vessels and piping conference; Minneapolis, MN (United States); 19-23 Jun 1994)			
	20:789	*See* CEA-CONF–11783			
27	20:1453	*See* WHC-SA–2141			
CONF-9406131–		(Coal-fired power systems: advances in IGCC and PFBC review meeting; Morgantown, WV (United States); 21-23 Jun 1994)			
2	20:1492	*See* DOE/OR/21400–94/C0354			
57	20:71	*See* IS-M–804			
58	20:14	*See* DOE/MC/28202–94/C0351			
59	20:7	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002064	MF-106
60	20:63	*See* DOE/MC/28016–94/C0378			
61	20:64	*See* DOE/MC/29261–94/C0377			
62	20:729	*See* DOE/MC/30040–94/C0380			
63	20:60	*See* DOE/ER/80896–94/C0379			
64	20:61	*See* DOE/ER/81349–94/C0356			
CONF-9406134–		(SOLAR '94: American Solar Energy Society conference; San Jose, CA (United States); 25-30 Jun 1994)			
4	20:1021	*See* LBL–34458			
CONF-9406150–		(13. IEEE symposium and international symposium on mass storage systems: towards distributed storage and data management systems; Annecy (France); 12-16 Jun 1994)			
1	20:2560	*See* UCRL-JC–115854			
CONF-940618–		(4. European particle accelerator conference; London (United Kingdom); 27 Jun - 1 jul 1994)			
103	20:1612	*See* SLAC-PUB–6548			
104	20:1613	*See* SLAC-PUB–6552			
105	20:1614	*See* SLAC-PUB–6553			
83	20:1593	*See* SLAC-PUB–6535			
90	20:1608	*See* SLAC-PUB–6517			
96	20:1609	*See* SLAC-PUB–6533			
98	20:1610	*See* SLAC-PUB–6539			
99	20:1611	*See* SLAC-PUB–6540			
CONF-9406212–		(Antibes conference on nuclear shapes and nuclear structure at low excitation energies; Antibes (France); 20-25 Jun 1994)			
3	20:2295	*See* LA-UR–94-3533			
CONF-9406241–		(Inversion methods in ocean and seismic acoustics conference; La Spezia (Italy); 27 Jun 1994)			
1	20:1974	*See* UCRL-JC–115131			
CONF-9406242–		(Workshop on the future of high sensitivity charm experiments; Batavia, IL (United States); 7-9 Jun 1994)			
3	20:1548	*See* FNAL/C–94/213			
5	20:1623	*See* FNAL/C–94/284-E			
CONF-9406265–		(6. Rencontres de Blois: the heart of the matter; Orsay (France); 10-25 Jun 1994)			
2	20:2156	*See* FNAL/C–94/345-E			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-940657–		(17. symposium on effects of radiation on materials; Sun Valley, ID (United States); 20-23 Jun 1994)			
2	20:1169	*See* ANL/ET/CP–83313			
6	20:1162	*See* SAND–94-1539C			
CONF-940664–		(ISFNT-3: 3rd international symposium on fusion nuclear technology; Los Angeles, CA (United States); 27 Jun - 1 jul 1994)			
28	20:2429	*See* ANL/TD/CP–83926			
29	20:2430	*See* ANL/TD/CP–83927			
34	20:1100	*See* ANL/ET/CP–81606			
CONF-940671–		(IEEE international symposium on electrical insulation; Pittsburgh, PA (United States); 5-8 Jun 1994)			
1	20:887	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001422	MF-407
CONF-940681–		(Advanced accelerator concepts workshop; Lake Geneva, WI (United States); 13-18 Jun 1994)			
1	20:1516	*See* BNL–60826			
2	20:1515	*See* BNL–60774			
3	20:1530	*See* BNL–60878			
CONF-940697–		(International conference on perspectives for the interacting Boson model on the occasion of its 20th anniversary; Padua (Italy); 13-17 Jun 1994)			
3	20:2206	*See* BNL–60808			
4	20:2205	*See* BNL–60807			
CONF-940701–		(Meeting on materials and mechanisms of superconductivity: high temperature superconductors; Grenoble (France); 4-9 Jul 1994)			
21	20:2384	*See* IS-M–797			
CONF-940704–		(International conference on solid-to-solid phase transformations in organic materials; Pittsburgh, PA (United States); 17-22 Jul 1994)			
4	20:1106	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001358	MF-404
CONF-940707–		(14. international conference on atomic physics; Boulder, CO (United States); 31 Jul - 5 aug 1994)			
	20:1630	*See* GSI–94-58(prepr.)			
CONF-940711–		(25. international symposium on combustion; Irvine, CA (United States); 31 Jul - 5 aug 1994)			
18	20:1426	*See* SAND–94-8730C			
CONF-9407115–		(Electronic structure of solids using cluster methods workshop; East Lansing, MI (United States); 17-19 Jul 1994)			
2	20:2387	*See* UCRL-JC–118407			
CONF-9407121–		(Workshop on beam instabilities in storage rings; Hefei (China); 25-30 Jul 1994)			
4	20:1532	*See* FNAL/C–94/253			
CONF-9407126–		(2. DOE-Energy Research Power users symposium; Rockville, MD (United States); 12 Jul 1994)			
1	20:1948	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018118	MF-408
CONF-9407127–		(8. international symposium on very high energy cosmic ray interactions; Tokyo (Japan); 24-31 Jul 1994)			
2	20:2155	*See* FNAL/C–94/343-E			
CONF-940713–		(3. international conference on inorganic membranes; Worcester, MA (United States); 10-14 Jul 1994)			
2	20:17	*See* DOE/METC/C–95/7158			
CONF-9407130–		(Low-slope re-roofing workshop; Oak Ridge, TN (United States); 18 Jul 1994)			
Summ.	20:1431	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000495	MF-1600
CONF-9407133–		(50th anniversary of the phase stability principle meeting; Moscow (Russian Federation); 12-15 Jul 1994)			
2	20:1523	*See* LBL–35966			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9407135–		(QCD 94: nuclear physics B; Montpellier (France); 7-13 Jul 1994)			
	20:2083	*See* GSI–94-53(prepr.)			
CONF-9407136–		(School of physics: Enrico Fermi; Varenna (Italy); 12-22 Jul 1994)			
1	20:1872	*See* BNL–60834			
CONF-9407137–		(8. annual meeting of the consortium for fossil fuel liquefaction science; Snowbird, UT (United States); 6-9 Jul 1994)			
1	20:49	*See* IS-M–799			
CONF-9407138–		(19. linear accelerator meeting in Japan; Tokai (Japan); 20-22 Jul 1994)			
	20:1512	*See* JAERI-Conf–94-003			
CONF-940714–		(International meeting on synchrotron radiation instrumentation; Stony Brook, NY (United States); 18-22 Jul 1994)			
32	20:1605	*See* LBL–35843			
33	20:1604	*See* LBL–35535			
34	20:1591	*See* LBL–35865			
35	20:1590	*See* LBL–35844			
36	20:1663	*See* BNL–60892			
37	20:1528	*See* BNL–60862			
CONF-9407140–		(Aix-les-Baines TEAM workshop; Aix-les-Baines (France); 7-8 Jul 1994)			
1	20:2525	*See* ANL/MCS/CP–84283			
CONF-9407143–		(International conference nuclei in the cosmos; Gran Sasso (Italy); 8-13 Jul 1994)			
1	20:2025	*See* LBL–35929			
CONF-9407148–		(19. International Symposium on Rarefied Gas Dynamics; Oxford (United Kingdom); 25-29 Jul 1994)			
	20:148	*See* CEA-CONF–11806			
CONF-9407149–		(7. International Symposium on Applications of Laser Techniques to Fluid Mechanics; Lisbonne (Portugal); 11 Jul 1994)			
	20:1462	*See* CEA-CONF–11782			
CONF-940722–		(27. international conference on high energy physics; Glasgow (United Kingdom); 21-27 Jul 1994)			
27	20:1656	*See* SLAC-PUB–6686			
28	20:2181	*See* SLAC-PUB–6586			
29	20:2153	*See* FNAL/C–94-336-E			
30	20:2152	*See* FNAL/C–94/325-E			
CONF-940724–		(International compressor engineering conference; West Lafayette, IN (United States); 19-22 Jul 1994)			
1	20:1037	OSTI; Institute of Gas Technology, 3424 South State Str., Chicago, IL 60616		TI94017661	
CONF-940748–		(Institute of Nuclear Materials Management annual meeting; Naples, FL (United States); 17-20 Jul 1994)			
31	20:560	*See* SAND–94-1881C			
35	20:558	*See* LA-UR–94-2082			
CONF-9408113–		(SCES '94; Amsterdam (Netherlands); Aug 1994)			
5	20:1232	*See* IS-M–803			
CONF-9408123–		(1994 joint Army, Navy, NASA, Air Force (JANNAF) propulsion systems hazards meeting; San Diego, CA (United States); 1-5 Aug 1994)			
4	20:1689	*See* SAND–94-8709C			
CONF-9408125–		(17. international LINAC conference; Tsukuba (Japan); 21-26 Aug 1994)			
38	20:2445	*See* LBL–36067			
CONF-9408126–		(37. midwest symposium on circuits and systems; Lafayette, LA (United States); 2-5 Aug 1994)			
4	20:884	*See* SAND–94-8724C			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-940813–		(208. American Chemical Society national meeting; Washington, DC (United States); 21-26 Aug 1994)			
29	20:317	*See* SAND–94-2380C			
CONF-9408131–		(8. international conference on x-ray absorption fine structure; Berlin (Germany); 28 Aug - 2 sep 1994)			
4	20:2342	*See* UCRL-JC–117613			
CONF-9408132–		(AIAA small satellite conference; Logan, UT (United States); 29 Aug - 1 sep 1994)			
3	20:1696	*See* SAND–94-1817C			
CONF-9408146–		(16. international free electron laser conference; Stanford, CA (United States); 21-26 Aug 1994)			
9	20:1517	*See* BNL–60827			
11	20:1524	*See* LBL–36110			
CONF-940815–		(International nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994)			
81	20:310	*See* PNL-SA–23850			
86	20:922	*See* PNL-SA–24404			
87	20:1334	*See* PNL-SA–23466			
88	20:1333	*See* PNL-SA–23112			
CONF-9408150–		(10. international workshop of inelastic ion-surface collisions; Grand Targhee Resort, WY (United States); 8-12 Aug 1994)			
2	20:2347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001348	MF-421
CONF-9408155–		(22. international conference on physics of semiconductors; Vancouver (Canada); 15-19 Aug 1994)			
9	20:1283	*See* LBL–35358			
10	20:2397	*See* LBL–36063			
11	20:2306	*See* LBL–35940			
CONF-940816–		(Meeting of the Division of Particles and Fields of the American Physical Society; Albuquerque, NM (United States); 2-6 Aug 1994)			
37	20:2199	*See* SLAC-PUB–6595			
38	20:2233	*See* BNL–60809			
39	20:1624	*See* FNAL/C–94/320-E			
40	20:2154	*See* FNAL/C–94/341-E			
41	20:2151	*See* FNAL/C–94-274-E			
42	20:2270	*See* LBL–36104			
43	20:2269	*See* LBL–36103			
44	20:1622	*See* FNAL/C–94/281-E			
45	20:1626	*See* FNAL/C–94/342-E			
46	20:2191	*See* FNAL/C–94/314-E			
47	20:2150	*See* FNAL/C–94/216-E			
CONF-9408170–		(Distributed digital systems workshop on plant process computer and networks; Charlotte, NC (United States); 16-18 Aug 1994)			
2	20:806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001427	MF-520
CONF-9408174–		(Aerospace environmental technology conference; Huntsville, AL (United States); 10-11 Aug 1994)			
2	20:1338	*See* Y/DZ–1113/R1			
CONF-9408175–		(Engineering Foundation conference on plastic deformation of ceramics; Snowbird, UT (United States); 7-12 Aug 1994)			
1	20:1240	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001071	MF-1505
CONF-9408176–		(ISPP workshop on the theory of fusion plasmas; Varenna (Italy); 22-26 Aug 1994)			
1	20:2408	*See* GA-A–21778			
CONF-9408177–		(American Institute of Aeronautics and Astronautics (AIAA) atmospheric flight mechanic conference; Scottsdale, AZ (United States); 1-3 Aug 1994)			
1	20:1699	*See* SAND–94-1606C			
CONF-9408178–		(43. annual Denver x-ray conference; Steamboat Spring, CO (United States); 1-5 Aug 1994)			
1	20:1673	*See* SAND–94-1071C			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9408179–		(Alternative fuels of the ACS national meeting; Pittsburgh, PA (United States); Aug 1994)			
1	20:48	*See* IS-M–798			
CONF-940830–		(13. international conference on thermoelectrics; Kansas City, MO (United States); 30 Aug - 1 sep 1994)			
2	20:1004	*See* UCRL-JC–117602			
CONF-940859–		(5. international symposium on robotics and manufacturing; Maui, HI (United States); 14-18 Aug 1994)			
27	20:1038	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001428	MF-406
CONF-940876–		(International Ergonomics Association workshop; Toronto (Canada); 15-19 Aug 1994)			
2	20:2564	*See* UCRL-JC–117548			
CONF-940907–		(Annual technical conference and exhibition of the Society of Petroleum Engineers (SPE); New Orleans, LA (United States); 25-28 Sep 1994)			
1	20:122	*See* LA-UR–94-2871			
2	20:105	*See* SAND–94-1745C			
CONF-9409102–		(OCEANS '94; Brest (France); 13-16 Sep 1994)			
1-Rev.1	20:1675	*See* UCRL-JC–116176-Rev.1			
CONF-9409103–		(International symposia on high energy spin physics and polarization phenomena in nuclear physics; Bloomington, IN (United States); 15-22 Sep 1994)			
1	20:2234	*See* BNL–60923			
2	20:2182	*See* SLAC-PUB–6665			
CONF-9409107–		(International meeting on reduced enrichment for research and test reactors; Williamsburg, VA (United States); 18-22 Sep 1994)			
3	20:839	*See* ANL/ET/CP–84257			
CONF-9409160–		(3. annual clean coal technology conference; Chicago, IL (United States); 6-8 Sep 1994)			
1	20:80	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001969	MF-105
CONF-9409168–		(Coal liquefaction and gas conversion contractors' review conference; Pittsburgh, PA (United States); 7-8 Sep 1994)			
7	20:52	*See* SAND–94-1940C			
8	20:134	*See* ANL/ET/CP–83730			
CONF-940917–		(3. international conference on heat transfer: advanced computational methods in heat transfer; Southampton (United Kingdom); 5-7 Sep 1994)			
1	20:1448	*See* SAND–94-2354C			
CONF-9409170–		(Photovoltaic performance and reliability workshop; Lakewood, CO (United States); 21-23 Sep 1994)			
1	20:694	*See* SAND–94-2498C			
CONF-9409177–		(Optical Society of America conference on extreme ultraviolet lithography; Monterey, CA (United States); 19-21 Sep 1994)			
4	20:1428	*See* BNL–60902			
CONF-9409178–		(American Chemical Society meeting on industrial and engineering chemistry; Atlanta, GA (United States); 19-21 Sep 1994)			
9	20:256	*See* EGG-M–94273			
10	20:291	*See* LA-UR–94-3491			
CONF-9409181–		(19. Department of Energy conference on compatibility, aging and service life; Los Alamos, NM (United States); 28-30 Sep 1994)			
9	20:312	*See* RFP–4873			
CONF-9409211–		(American Institute of Aeronautics and Astronautics space programs and technologies conference and exhibit; Birmingham, AL (United States); 27 Sep 1994)			
4	20:1698	*See* SAND–94-0378C			
5	20:1461	*See* Y/DW–1341			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9409212–		(6. Commission of European Countries (CEC) natural analogue working group meeting; Santa Fe, NM (United States); 12-16 Sep 1994)			
2	20:1856	*See* LA-UR–94-3595			
CONF-9409224–		(Biomass pyrolysis oil properties and combustion meeting; Estes Park, CO (United States); 26-28 Sep 1994)			
Absts.	20:629	*See* NREL/CP–433-7265			
CONF-9409225–		(Physics of nuclear induced plasmas and problems of nuclear pumped lasers; Arzamas (Russian Federation); 26-30 Sep 1994)			
1	20:1441	*See* LA-UR–94-3181			
2	20:1508	*See* SAND–94-2469C			
CONF-9409226–		(ECLIM 23: laser interaction with matter; Oxford (United Kingdom); 19-23 Sep 1994)			
1	20:1971	*See* LA-UR–94-3124			
3	20:2441	*See* LA-UR–94-3165			
CONF-9409227–		(6. international symposium on plasticity of metals and alloys; Prague (Czech Republic); 5-9 Sep 1994)			
1	20:1107	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001070	MF-404
CONF-9409228–		(Drexel conference on quantum non integrability; Philadelphia, PA (United States); Sep 1994)			
1	20:2001	*See* LA-UR–94-3329			
CONF-9409229–		(MGA user's workshop; Geel (Belgium); 19-20 Sep 1994)			
1	20:1331	*See* LA-UR–94-3331			
CONF-9409233–		(Biennial regulatory information conference; Columbus, OH (United States); 7 Sep 1994)			
1	20:985	*See* ANL/DIS/CP–84102			
CONF-9409234–		(Toxicology in vitro workshop; Cartausi (Switzerland); 20-23 Sep 1994)			
1	20:1967	*See* LA-UR–94-3210			
CONF-9409235–		(DOE/CEA-DAM conference; Paris (France); 12-14 Sep 1994)			
1	20:1587	*See* LA-UR–94-3213			
CONF-9409236–		(2. IWACA workshop; Heidlegerg (Germany); 26-28 Sep 1994)			
1	20:2559	*See* SAND–94-8718C			
CONF-9409237–		(12. international conference on the properties of water and steam; Washington, DC (United States); Sep 1994)			
1	20:290	*See* LA-UR–94-3359			
CONF-9409238–		(Workshop on rock mechanics; Rockville, MD (United States); 19-20 Sep 1994)			
2	20:467	*See* SAND–94-2339C			
CONF-9409240–		(14. annual international meeting of wind turbine test stations; Boulder, CO (United States); 12-13 Sep 1994)			
	20:724	*See* NREL/CP–442-6877			
CONF-940930–		(11. annual international Pittsburgh coal conference: coal, energy and the environment; Pittsburgh, PA (United States); 12-16 Sep 1994)			
4	20:18	*See* DOE/METC/C–95/7161			
CONF-940933–		(15. international conference on plasma physics and controlled nuclear fusion research; Seville (Spain); 26 Sep - 1 oct 1994)			
10	20:2423	*See* PPPL-CFP–3167			
11	20:2422	*See* PPPL-CFP–3163			
12	20:2447	*See* UCRL-JC–118161			
13	20:2444	*See* LA-UR–94-3667			
14	20:2443	*See* LA-UR–94-3665			
15	20:2417	*See* LA-UR–94-3666			
CONF-940970–		(7. international symposium on solar thermal concentrating technologies; Moscow (Russian Federation); 26-30 Sep 1994)			
1	20:708	*See* SAND–94-2431C			
2	20:701	*See* SAND–94-2432C			
3	20:707	*See* SAND–94-1758C			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
4	20:883	*See* SAND–94-2400C			
5	20:702	*See* SAND–94-2437C			
CONF-940976–		(1. International workshop on accelerator-based neutron sources for boron neutron capture therapy; Jackson, WY (United States); 11-14 Sep 1994)			
1	20:1871	*See* ANL/TD/CP–82768			
CONF-940981–		(21. international symposium on compound semiconductors; San Diego, CA (United States); 18-22 Sep 1994)			
3	20:1284	*See* LBL–35433			
CONF-940983–		(2. international symposium and exhibition on environmental contamination in Central and Eastern Europe; Budapest (Hungary); 20-23 Sep 1994)			
4	20:219	*See* ANL/ET/CP–83175			
CONF-940985–		(American Society for Quality Control Energy and Environmental Quality Division conference; Tucson, AZ (United States); 18-21 Sep 1994)			
6	20:334	*See* WHC-SA–2559			
CONF-941001–		(41. annual American Vacuum Society symposium; Denver, CO (United States); 24-28 Oct 1994)			
1	20:1287	*See* SAND–94-1318C			
2	20:2558	*See* SAND–94-2548C			
3	20:1286	*See* SAND–94-1280C			
4	20:1340	*See* BNL–60952			
6	20:1157	*See* LA-UR–94-3499			
CONF-941007–		(Joint power generation conference; Phoenix, AZ (United States); 2-6 Oct 1994)			
1	20:770	*See* GA-A–21720			
CONF-941010–		(4. international conference on nuclear microprobe technology and applications; Shanghai (China); 10-14 Oct 1994)			
1	20:1336	*See* UCRL-JC–116407			
CONF-941013–		(Applied superconductivity conference; Boston, MA (United States); 16-21 Oct 1994)			
2	20:1168	*See* ANL/ET/CP–82340			
3	20:1238	*See* LA-UR–94-3568			
6	20:1478	*See* ANL/ET/CP–82313			
CONF-9410131–		(1994 hypervelocity impact symposium; Santa Fe, NM (United States); 16-20 Oct 1994)			
7	20:1444	*See* SAND–93-3909C			
8	20:1682	*See* SAND–93-4074C			
9	20:1681	*See* SAND–93-4018C			
CONF-9410154–		(SPIE international symposium on photonic sensors and controls for commercial applications; Boston, MA (United States); 31 Oct - 4 nov 1994)			
1	20:2562	*See* UCRL-JC–116963			
2	20:2565	*See* UCRL-JC–118154			
CONF-9410156–		(28. annual Asilomar conference on signals, systems, and computers; Pacific Grove, CA (United States); 31 Oct - 2 nov 1994)			
2	20:1667	*See* SAND–94-1375C			
CONF-9410165–		(Neutron scattering; Sendai (Japan); 11-14 Oct 1994)			
3	20:1330	*See* LA-UR–94-2736			
8	20:1174	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001357	MF-404
CONF-941017–		(4. conference on radiation protection and dosimetry; Orlando, FL (United States); 24-27 Oct 1994)			
2	20:1911	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019147	MF-407
CONF-9410170–		(1. European solid oxide fuel cell forum: engineering, systems, applications; Lucerne (Switzerland); 3-7 Oct 1994)			
1	20:1012	*See* DOE/METC/C–95/7162			
CONF-9410176–		(6. national bioenergy conference; Reno, NV (United States); 2-6 Oct 1994)			
1	20:630	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001347	MF-1503

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9410181–		(15. aerospace testing seminar; Manhattan Beach, CA (United States); 11-13 Oct 1994)			
2	20:793	*See* SAND–94-2376C			
3	20:792	*See* SAND–94-2033C			
CONF-9410184–		(The Metallurgical Society (TMS) conference on high performance composites; Rosemont, IL (United States); 10-15 Oct 1994)			
4	20:1143	*See* IS-M–795			
5	20:1144	*See* IS-M–796			
CONF-9410186–		(Conference on robotics motion and machine vision; Aachen (Germany); 31 Oct - 4 nov 1994)			
1	20:1432	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017902	MF-406
CONF-9410187–		(Shock and vibration symposium; San Diego, CA (United States); 31 Oct 1994)			
1	20:1684	*See* SAND–94-2144C			
3	20:1683	*See* SAND–94-1016C			
CONF-9410189–		(Applications of lasers and electro-optics; Orlando, FL (United States); 17-20 Oct 1994)			
1	20:1451	*See* UCRL-JC–117078			
2	20:1155	*See* LA-UR–94-2845			
5	20:1164	*See* SAND–94-2676C			
CONF-9410195–		(GaAs symposium; Philadelphia, PA (United States); 16-19 Oct 1994)			
1	20:1505	*See* SAND–94-1302C			
2	20:2557	*See* SAND–94-2349C			
CONF-9410196–		(Faults populations meeting; Edinburgh (United Kingdom); 17-21 Oct 1994)			
1	20:1972	*See* LA-UR–94-2739			
CONF-9410197–		(Mid-America conference on intelligent systems; Overland Park, KS (United States); 27 Oct 1994)			
1	20:1046	*See* KCP–613-5496			
CONF-9410212–		(Cray user's group conference; Tours (France); 10-14 Oct 1994)			
3	20:1475	*See* LA-UR–94-3449			
CONF-9410213–		(1994 international conference on tungsten and refractory metals; McLean, VA (United States); 17-19 Oct 1994)			
1	20:1156	*See* LA-UR–94-3284			
CONF-9410215–		(Microscopic and macroscopic approaches to detonation workshop; St. Malo (France); 1-8 Oct 1994)			
2	20:1687	*See* LA-UR–94-3316			
CONF-9410217–		(Northeast Sustainable Energy Association (NESEA) symposium; Providence, RI (United States); 3-5 Oct 1994)			
1	20:1006	*See* ANL/CMT/CP–84205			
CONF-9410218–		(Pulsed radio frequency sources for linear colliders; Long Island, NY (United States); 2-7 Oct 1994)			
1	20:1509	*See* SAND–94-2542C			
CONF-9410219–		(Beam instrumentation workshop; Vancouver (Canada); 2-6 Oct 1994)			
1	20:1651	*See* LA-UR–94-3344			
2	20:1588	*See* LA-UR–94-3362			
3	20:2532	*See* BNL–60655			
4	20:1543	*See* BNL–60553			
5	20:1546	*See* BNL–60926			
7	20:1589	*See* LA-UR–94-3388			
CONF-9410221–		(Electric, hybrid and alternative fuel vehicles conference; Aachen (Germany); 31 Oct - 4 nov 1994)			
1	20:1072	*See* ANL/ES/CP–82394			
2	20:1073	*See* ANL/ES/CP–82395			
CONF-9410222–		(7. international symposium on acoustic remote sensing and associated techniques of the atmosphere and oceans; Boulder, CO (United States); 3-7 Oct 1994)			
1	20:717	*See* ANL/ER/CP–82594			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9410224–		(Laser interaction with matter; Oxford (United Kingdom); Oct 1994)			
1	20:2442	*See* LA-UR–94-3221			
CONF-9410225–		(WELDEC: workshop on electronics and detectors cooling; Lausanne (Switzerland); 4-7 Oct 1994)			
1	20:1649	*See* LA-UR–94-3167			
CONF-9410228–		(Licensing Executives Society annual meeting; Waikoloa, HI (United States); 16-19 Oct 1994)			
1	20:936	*See* SAND–94-2581C			
CONF-9410229–		(4. international conference on charged particle optics; Tsukuba (Japan); 3-6 Oct 1994)			
1	20:1539	*See* LA-UR–94-3351			
CONF-9410230–		(9. annual conference on contaminated soils, analysis, fate, environmental and public health effects, remediation and regulation; Amherst, MD (United States); 17-20 Oct 1994)			
1	20:1773	*See* ANL/EA/CP–84264			
CONF-9410231–		(8. Deneb user group meeting; Detroit, MI (United States); 10-14 Oct 1994)			
1	20:186	*See* WHC-SA–2664			
CONF-9410232–		(Materials Research Society meeting; Tokyo (Japan); 24-25 Oct 1994)			
1	20:561	*See* SAND–94-2570C			
CONF-941050–		(European Wind Energy Association conference and exhibition; Thessaloniki (Greece); 10-14 Oct 1994)			
1	20:1001	*See* NREL/TP–442-7227			
CONF-941061–		(Nuclear science symposium: medical imaging conference; Norfolk, VA (United States); 30 Oct - 5 nov 1994)			
5	20:1545	*See* BNL–60907			
7	20:1767	*See* LA-UR–94-3674			
CONF-941062–		(Annual meeting of the Optical Society of America; Dallas, TX (United States); 2-7 Oct 1994)			
2	20:1522	*See* LA-UR–94-3462			
CONF-941063–		(186. meeting of the Electrochemical Society; Miami, FL (United States); 9-14 Oct 1994)			
7	20:2307	*See* SAND–94-1670C			
8	20:899	*See* SAND–94-1398C			
10	20:895	*See* BNL–60533			
CONF-941075–		(18. international symposium on the scientific basis for nuclear waste management; Kyoto (Japan); 23-27 Oct 1994)			
1	20:288	*See* LA-UR–94-2891			
2	20:315	*See* SAND–94-0805C			
3	20:322	*See* UCRL-JC–116431			
CONF-941085–		(Visualization '94; Washington, DC (United States); 17-21 Oct 1994)			
1-Rev.1	20:2561	*See* UCRL-JC–116231-Rev.1			
CONF-941086–		(38. annual meeting of the Human Factors and Ergonomics Society; Nashville, TN (United States); 24-28 Oct 1994)			
3	20:2563	*See* UCRL-JC–117547			
CONF-941091–		(25. Project Management Institute annual seminar and symposium; Vancouver (Canada); 17-19 Oct 1994)			
2	20:521	*See* WHC-SA–2235			
CONF-941101–		(Meeting of the Division of Plasma Physics of the American Physical Society; Minneapolis, MN (United States); 7-11 Nov 1994)			
1	20:1592	*See* SAND–94-1911C			
CONF-941102–		(Winter meeting of the American Nuclear Society; Washington, DC (United States); 13-18 Nov 1994)			
29	20:2277	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001352	MF-405
30	20:514	*See* SAND–94-2703C			
31	20:1506	*See* SAND–94-1978C			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9411123–		(Institute of Electrical and Electronics Engineers (IEEE) Microwave Theory & Technology Society and Laser Electro-Optical Society conference; Ile-de-France (France); 21-23 Nov 1994)			
1	20:1668	*See* SAND–94-2156C			
CONF-941113–		(Conference on development and application of computer techniques to environmental studies: Envirosoft '94; San Francisco, CA (United States); 16-18 Nov 1994)			
1	20:1368	*See* PPPL-CFP–3140			
CONF-9411132–		(Topical conference on the synthesis and processing of electronic materials; San Francisco, CA (United States); 13-18 Nov 1994)			
1	20:1507	*See* SAND–94-2201C			
CONF-9411133–		(Artificial neural networks in engineering conference; Rolla, MO (United States); 13-16 Nov 1994)			
1	20:2280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000688	MF-411
CONF-9411134–		(IFMA '94; St. Louis, MO (United States); 6-9 Nov 1994)			
1	20:2516	*See* LA-UR–94-3184			
CONF-9411137–		(Frontiers in education conference; San Jose, CA (United States); 3-6 Nov 1994)			
1	20:1427	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001350	MF-405
CONF-9411138–		(30. American Water Resources Association (AWRA) annual conference on water quality; Chicago, IL (United States); 6-10 Nov 1994)			
1	20:227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001349	MF-2010
CONF-9411139–		(Optimizing the technology transfer function; Chicago, IL (United States); 2-4 Nov 1994)			
1	20:937	*See* WHC-SA–2683			
CONF-9411141–		(Air Transport Association non-destructive inspection conference; Albuquerque, NM (United States); 1-3 Nov 1994)			
1	20:1033	*See* SAND–94-2625C			
CONF-941128–		(Annual meeting of the American Institute of Chemical Engineers; San Francisco, CA (United States); 13-18 Nov 1994)			
2	20:613	*See* WSRC-MS–94-0180			
CONF-941129–		(Conference on application of accelerators in research and industry; Denton, TX (United States); 7-10 Nov 1994)			
2	20:1525	*See* SAND–94-1859C			
4	20:1544	*See* BNL–60874			
5	20:1890	*See* LBL–35802			
6	20:2341	*See* SAND–95-8424C			
7	20:1293	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002601	MF-113
8	20:1237	*See* LA-UR–94-3537			
CONF-941142–		(American Society of Mechanical Engineers' winter annual meeting; Chicago, IL (United States); 9-11 Nov 1994)			
20	20:1452	*See* UCRL-JC–117820			
21	20:871	*See* BNL-NUREG–60392			
22	20:1445	*See* SAND–94-1181C			
CONF-941144–		(Fall meeting of the Materials Research Society; Boston, MA (United States); 28 Nov - 2 dec 1994)			
1	20:1158	*See* LA-UR–94-3656			
CONF-941148–		(ANS meeting on environmental aspects of decommissioning, decontamination, and/or environmental restoration at nuclear and mixed waste facilities; Washington, DC (United States); 13-17 Nov 1994)			
1	20:540	*See* WSRC-IM–94-42			
CONF-941152–		(Conference and exposition on petroleum hydrocarbons; Houston, TX (United States); 2-4 Nov 1994)			
1	20:1839	*See* UCRL-JC–118432			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-941187–		(16. North American conference: the world oil and gas industries in the 21st century; Dallas, TX (United States); 6-9 Nov 1994)			
1	20:1013	*See* BNL–60930			
CONF-941189–		(SUPERFUND XV: 15th environmental conference and exhibition for the hazardous materials/hazardous waste management industry; Washington, DC (United States); 29 Nov - 1 dec 1994)			
1	20:1821	*See* K/HWP–26			
CONF-941199–		(Meeting on the revolution in microelectronics; Boston, MA (United States); 15-17 Nov 1994)			
3	20:1500	*See* KCP–613-5388			
CONF-941207–		(Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994)			
9	20:816	*See* EGG-M–94222			
10	20:522	*See* WHC-SA–2653			
13	20:211	*See* WSRC-MS–94-0563			
CONF-941217–		(International electron devices meeting: annual technical meeting of the Electron Devices Society of the Institution of Electrical and Electronics Engineers; San Francisco, CA (United States); 11-14 Dec 1994)			
1	20:1594	*See* SLAC-PUB–6677			
CONF-941221–		(12. International electric vehicle symposium; Anaheim, CA (United States); 5-7 Dec 1994)			
2	20:1083	*See* NREL/TP–473-7260			
CONF-941235–		(Spent nuclear fuel: challenges and initiatives; Sun Valley, ID (United States); 14-16 Dec 1994)			
1	20:210	*See* WSRC-MS–94-0284			
CONF-941237–		(Spent nuclear fuel meeting: challenges and initiatives; Emerging technologies in hazardous waste management conference; Salt Lake City, UT (United States); Atlanta, GA (United States); 14-16 Dec 1994; 13-16 dec 1994)			
1	20:522	*See* WHC-SA–2653			
CONF-950101–		(Advanced solid-state laser conference; Memphis, TN (United States); 29 Jan - 1 feb 1995)			
1	20:1765	*See* LA-UR–94-3132			
2	20:1503	*See* LA-UR–94-3057			
CONF-950104–		(American Society of Heating, Refrigerating and Air-Conditioning Engineers winter meeting and exhibition; Chicago, IL (United States); 28 Jan - 1 feb 1995)			
1	20:1015	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017876	MF-1600
CONF-950110–		(12. symposium on space nuclear power and propulsion; Albuquerque, NM (United States); 8-12 Jan 1995)			
1	20:1002	*See* LA-UR–94-1938			
2	20:791	*See* LA-UR–94-2701			
5	20:1005	*See* WHC-SA–2489			
CONF-950121–		(10. annual battery conference on applications and advances; Long Beach, CA (United States); 10-13 Jan 1995)			
1	20:1674	*See* SAND–94-2472C			
CONF-950130–		(33. American Institute of Aeronautics and Astronautics (AIAA) aerospace sciences meeting; Reno, NV (United States); 9-12 Jan 1995)			
1	20:2533	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017861	MF-405
CONF-950145–		(Conference on accelerator-driven transmutation technologies and applications (A-DTTA); Albuquerque, NM (United States); 8-12 Jan 1995)			
1	20:1693	*See* LA-UR–94-3170			
2	20:1694	*See* LA-UR–94-3171			
CORR–84-00054	20:1778	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002667	MF-702

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CPT–					
93/P-2935.	20:2060	*See* LAPP–440-93			
CTP-TAMU–					
30/93	20:2062	*See* LAPP-A–427-93			
DESY–					
93-123C	20:2100	OSTI; NTIS (US Sales Only); INIS		DE95711481	
93-196	20:2143	OSTI; NTIS (US Sales Only); INIS		DE95711697	
94-103	20:1601	OSTI; NTIS (US Sales Only); INIS		DE95715137	
94-109	20:2077	OSTI; NTIS (US Sales Only); INIS		DE95715133	
94-111	20:2144	OSTI; NTIS (US Sales Only); INIS		DE95715230	
94-115	20:2158	*See* IC–94/154			
94-116	20:2032	OSTI; NTIS (US Sales Only); INIS		DE95715135	
94-117	20:2145	OSTI; NTIS (US Sales Only); INIS		DE95715241	
94-118	20:2008	OSTI; NTIS (US Sales Only)		DE95711195	
94-119	20:1602	OSTI; NTIS (US Sales Only); INIS		DE95715136	
94-121	20:2146	OSTI; NTIS (US Sales Only); INIS		DE95711194	
94-137	20:2147	OSTI; NTIS (US Sales Only); INIS		DE95715037	
94-145	20:2078	OSTI; NTIS (US Sales Only); INIS		DE95715038	
DKRZ-TR–					
8	20:2567	OSTI; NTIS (US Sales Only)		DE95707881	
DOE-HDBK–					
1078-94	20:2455	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018722	MF-500
3012-94	20:2456	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001047	MF-500
DOE-STD–					
1077-94	20:2458	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018723	MF-500
1082-94	20:941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001461	MF-500
DOE-TSL–					
1-94A	20:2459	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019294	MF-500
4-94A	20:2460	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019293	MF-500
DOE/AL/43771–					
T4	20:130	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001553	MF-1412
DOE/AL/62350–					
113	20:487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018460	MF-2010
120	20:488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018464	MF-2010
135	20:489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018471	MF-2010
138	20:490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018462	MF-2010
139	20:491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018463	MF-2010
139-Rev.1	20:492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018475	MF-2010
43-Rev.1	20:228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018466	MF-2010
DOE/AL/73394–					
T1-Exec.Summ.	20:709	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017948	MF-1241
T1-Pt.2	20:710	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017950	MF-1241
DOE/AL/99286–					
T2	20:1039	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002021	MF-1400
DOE/AN/ACNT–					
94C	20:547	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001068	
DOE/BC/14431–					
1-App.	20:106	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000108	PC-122
1-Vol.1	20:107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000103	PC-122
1-Vol.3	20:108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000107	PC-122
1-Vol.4	20:109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000106	PC-122
1-Vol.5	20:110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000105	PC-122
DOE/BC/14653–					
3	20:95	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000111	PC-122
DOE/BC/14831–					
11	20:111	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002772	MF-122
DOE/BC/14856–					
T1	20:112	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001703	MF-122
DOE/BC/14862–					
6	20:113	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000102	PC-122

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/BC/14880–					
9	20:114	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002760	MF-122
DOE/BC/14895–					
3	20:96	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002759	MF-122
DOE/BC/14899–					
17	20:115	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000110	PC-122
DOE/BC/14953–					
5-Pt.1	20:97	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002789	MF-122
5-Pt.2	20:98	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002836	MF-122
DOE/BC/14959–					
10	20:99	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002770	MF-122
DOE/BC/14961–					
5	20:116	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002612	MF-122
DOE/BC/14963–					
5	20:117	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002766	MF-122
DOE/BC/14989–					
1	20:118	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002771	MF-122
DOE/BP–					
2455	20:638	*See* DOE/EA–0941			
DOE/CAO–					
941046	20:229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002262	MF-2070
DOE/CE/15479–					
T6	20:696	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001811	MF-1300
DOE/CE/15520–					
T13	20:1241	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002504	MF-1390
DOE/CE/15553–					
T6	20:119	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001762	MF-1240
DOE/CE/15557–					
T4	20:1016	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001150	MF-1400
DOE/CE/15594–					
T2	20:620	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002256	MF-1310
DOE/CE/15613–					
T2	20:1242	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002254	MF-1505
DOE/CE/23810–					
39	20:1243	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002199	MF-1600
DOE/CE/40942–					
3	20:1040	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002137	MF-1408
DOE/CE/41000–					
2	20:1063	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002851	MF-1406
DOE/CR–					
0028	20:925	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002534	MF-900
DOE/EA–					
0820	20:449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001759	MF-630
0870	20:8	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002668	MF-630
0879	20:450	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002678	MF-630
0885	20:1041	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002672	MF-606
0918	20:230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001760	MF-630
0941	20:638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001768	MF-630
0989	20:231	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002677	MF-630
0995	20:232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001761	MF-630
DOE/EE–					
0026	20:1075	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001711	MF-1501
0036	20:1970	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002273	MF-1380
DOE/EH–					
0001	20:913	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002644	MF-600
0419	20:2453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002323	MF-607
0421	20:915	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002535	MF-602
23-0002(a)	20:233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002646	MF-600
23-0002(b)	20:914	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002645	MF-600

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/EIA–					
0035(94/10)	20:923	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95002062	MF-950
0109(94/10)	20:125	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002205	MF-950
0130(94/10)	20:136	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE95002163	MF-950
0131(93)	20:137	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE95002470	MF-950
0208(94-43)	20:100	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001879	MF-950
0216(93)	20:101	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002536	MF-950
0226(94/10)	20:986	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002520	MF-950
0380(94/10)	20:980	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001555	MF-950
0538(94/95-2)	20:102	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001662	MF-950
0538(94/95-3)	20:103	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001872	MF-950
0538(94/95-4)	20:126	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002439	MF-950
0538(94/95-5)	20:127	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002679	MF-950
0538(94/95-6)	20:972	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002936	MF-950
0573(11/94)	20:1705	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003001	MF-950
DOE/EIS–					
0194-MAP	20:634	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017205	MF-630
0207	20:714	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001766	MF-630
DOE/EP/10050–					
T1	20:973	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001815	MF-900
T2	20:974	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001816	MF-900
DOE/ER–					
0620P	20:1845	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018617	MF-402
DOE/ER/00038–					
3707	20:1373	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001447	MF-404
DOE/ER/02504–					
391	20:2148	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014070	MF-414
DOE/ER/12108–					
T1	20:2279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001763	MF-406
DOE/ER/12130–					
T1	20:807	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002598	MF-404
DOE/ER/13188–					
9	20:1894	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002797	MF-408
DOE/ER/13282–					
10	20:1420	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001803	MF-401
DOE/ER/13289–					
T2	20:1294	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002597	MF-401
DOE/ER/13425–					
T2	20:1892	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002796	MF-408
DOE/ER/13426–					
T2	20:1893	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002794	MF-408
DOE/ER/13434–					
T2	20:1295	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002800	MF-401
DOE/ER/13506–					
52	20:2311	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002510	MF-406
DOE/ER/13519–					
8	20:2288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001807	MF-411
DOE/ER/13614–					
T1	20:1846	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002899	MF-408
T2	20:1847	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002900	MF-408
DOE/ER/13633–					
12	20:1374	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002690	MF-401
DOE/ER/13773–					
5	20:1341	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002203	MF-404
6	20:1342	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002204	MF-404
DOE/ER/13797–					
T1	20:1482	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002123	MF-406
DOE/ER/14053–					
T6	20:1421	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002801	MF-401
DOE/ER/14083–					
2	20:1779	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001765	MF-403
DOE/ER/14104–					
5	20:1375	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002944	MF-404
DOE/ER/14114–					
4	20:1343	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001808	MF-401
DOE/ER/14145–					
T3	20:2292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001204	MF-411
DOE/ER/14185–					
T1	20:682	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001548	MF-406
DOE/ER/14225–					
3	20:1344	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002943	MF-401

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ER/14258–					
2	20:1345	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002947	MF-401
DOE/ER/14333–					
T1	20:1296	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002255	MF-401
DOE/ER/25012–					
5	20:2534	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002805	MF-405
6	20:2535	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002808	MF-405
DOE/ER/25027–					
8	20:1422	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001387	MF-406
DOE/ER/25086–					
T2	20:2278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001702	MF-405
DOE/ER/25149–					
T1	20:2536	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002134	MF-400
DOE/ER/40200–					
323	20:2033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94013524	MF-414
DOE/ER/40344–					
8	20:2079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001800	MF-413
DOE/ER/40439–					
T2	20:2190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001812	MF-414
DOE/ER/40505–					
T1	20:2202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001764	MF-413
DOE/ER/40546–					
T6	20:2028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002447	MF-414
DOE/ER/40561–					
130	20:2080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012845	MF-413
133	20:2081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012847	MF-414
137	20:2149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001861	MF-414
141	20:2235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012853	MF-413
142	20:2034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012854	MF-414
DOE/ER/40697–					
3	20:2029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001804	MF-414
DOE/ER/40723–					
2	20:2276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94012482	MF-413
DOE/ER/40768–					
2	20:2236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001805	MF-414
DOE/ER/45085–					
T2	20:1244	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001813	MF-401
DOE/ER/45157–					
T6	20:1175	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002125	MF-404
T7	20:1670	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002126	MF-404
DOE/ER/45166–					
6	20:1108	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002599	MF-404
DOE/ER/45184–					
10	20:1109	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002941	MF-404
DOE/ER/45252–					
T6	20:1176	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001704	MF-404
DOE/ER/45283–					
8	20:1245	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001802	MF-404
DOE/ER/45330–					
T1	20:1246	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001867	MF-404
DOE/ER/45434–					
4	20:1247	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002945	MF-404
DOE/ER/45476–					
T1	20:1376	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002681	MF-401
DOE/ER/53188–					
1	20:2403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002138	MF-411
DOE/ER/53243–					
6	20:2404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94011634	MF-420
DOE/ER/54186–					
T2	20:2431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001817	MF-420
T3	20:1110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001818	MF-423
T4	20:2432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001819	MF-420; MF-422
T5	20:2433	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001820	MF-420
DOE/ER/60631–					
13	20:1912	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015657	PC-408
14	20:1913	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015659	PC-408
DOE/ER/60639–					
6	20:1873	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002200	MF-408
DOE/ER/60662–					
T3	20:1706	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003000	MF-402

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/ER/60675–					
7	20:1914	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002946	MF-408
DOE/ER/60773–					
4	20:1780	OSTI; NTIS; GPO Dep.	E 1.99:	DE94014597	MF-402
DOE/ER/60845–					
4	20:1781	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001326	MF-402
DOE/ER/60886–					
T3	20:1862	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001203	MF-402
DOE/ER/61030–					
T1	20:1707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001798	MF-402
DOE/ER/61071–					
T1	20:1708	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002798	MF-402
DOE/ER/61077–					
8	20:1949	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002948	MF-401; MF-406
DOE/ER/61447–					
1	20:1709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94010252	MF-401; MF-402
DOE/ER/61640–					
T1	20:1864	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001910	MF-408
DOE/ER/75464–					
3	20:1410	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002135	MF-400
DOE/ER/75698–					
T1	20:926	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001895	MF-400
DOE/ER/79236–					
1	20:2312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002850	MF-406
DOE/ER/80896–					
94/C0379	20:60	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001976	MF-106; MF-114
DOE/ER/81349–					
94/C0356	20:61	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001975	MF-114
DOE/ET–					
0023	20:2454	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002275	MF-900
0026	20:2568	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002274	MF-900
DOE/ET/34013–					
15	20:762	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001486	PC-523
DOE/ET/53088–					
667	20:2405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002614	MF-420
672	20:2009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002615	MF-421
678	20:2406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002617	MF-420
DOE/EW/50011–					
T1	20:1739	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001219	MF-2000
DOE/EW/50625–					
T18-Vol.1	20:2448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019072	MF-2000
T18-Vol.2	20:2449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019073	MF-2000
T18-Vol.3	20:2450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019074	MF-2000
T19	20:916	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002577	MF-2010
DOE/FE–					
0320	20:981	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002272	MF-126
DOE/FTR–					
94005434	20:2407	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94005434	MF-420
94008306	20:614	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94008306	MF-310
94008730	20:189	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE94008730	MF-706
DOE/GO–					
10094-010	20:726	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000201	PC-1350
DOE/HR–					
0096	20:1692	OSTI (Free of Charge)		TI95000779	MF-900
0112	20:2457	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001740	MF-900
DOE/HWP–					
160	20:1740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002970	
DOE/ID–					
10054(93)	20:234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002007	MF-2000
10390(94)-Rev.1	20:1782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001906	MF-2000

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
10454	20:235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002024	MF-2020
22110	20:451	OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center Open-File Reports Section, Box 25425, Mail Stop 517, Denver Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95001915	MF-702
22111	20:1849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002017	
22112	20:1783	OSTI; NTIS; INIS; U.S. Geological Survey, Open-File Reports Section, Box 25286, Denver Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95001914	MF-702
22113	20:1784	OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Report Section, Box 25286, Mail Stop 517, Federal Center, Denver, CO 80225 (United States); GPO Dep.	E 1.99:	DE95002016	MF-702
22114	20:1785	OSTI; NTIS; INIS; U.S. Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, Mail Stop 517, Denver Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95001912	MF-702
DOE/ID/12847–					
7	20:1111	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017940	PC-1419
DOE/ID/13040–					
T25	20:716	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001814	MF-1247
DOE/ID/13042–					
38	20:493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001650	MF-2010
DOE/ID/13074–					
T13	20:1076	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002253	MF-1501
DOE/ID/13233–					
T1	20:1112	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002238	MF-1420
DOE/IG–					
0183	20:977	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002417	MF-900
DOE/LLW–					
103-Rev.1	20:236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001911	MF-2020
139	20:237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001927	MF-2020
157-Rev.1	20:238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002045	MF-2020
188	20:239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001978	MF-2020
206	20:567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002013	MF-2020
207	20:1786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002014	MF-2020
212	20:452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002044	MF-2020
DOE/MC/23166–					
3833	20:81	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012267	MF-111
3869	20:82	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012294	MF-111
DOE/MC/24257–					
3796	20:9	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002464	MF-106; MF-111
3896	20:10	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001482	MF-111
DOE/MC/25185–					
3301	20:62	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001862	MF-107
DOE/MC/26006–					
3300	20:1007	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003104	MF-110
3804	20:1008	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002511	MF-105
3900	20:1009	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002506	MF-110
3901	20:1010	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002508	MF-110
DOE/MC/26008–					
3769	20:83	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002463	MF-111

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/MC/26026–					
3902	20:131	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001432	MF-131
DOE/MC/27286–					
3891	20:140	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000015	MF-103
DOE/MC/27391–					
3892	20:11	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000016	MF-109
DOE/MC/27423–					
3874	20:12	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012298	MF-109
3875	20:13	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012299	MF-109
DOE/MC/28016–					
94/C0378	20:63	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001757	MF-106
DOE/MC/28065–					
3880	20:1011	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000005	MF-110
DOE/MC/28139–					
3878	20:135	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001322	MF-131
DOE/MC/28202–					
94/C0351	20:14	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001341	MF-109
DOE/MC/28245–					
3909	20:1787	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002462	MF-2010
DOE/MC/29061–					
3868	20:727	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012293	MF-111
DOE/MC/29109–					
3898	20:1788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002509	MF-2000
DOE/MC/29113–					
3912	20:1433	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001479	MF-2070
DOE/MC/29246–					
3772	20:15	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002104	MF-106; MF-113
DOE/MC/29261–					
94/C0377	20:64	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001758	MF-106
DOE/MC/29444–					
3893	20:728	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000017	MF-109
DOE/MC/30012–					
3861	20:16	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012287	MF-106
DOE/MC/30040–					
94/C0380	20:729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001756	MF-109
DOE/MC/30086–					
3888	20:132	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000012	MF-132
3889	20:133	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000013	MF-132
DOE/MC/30098–					
3915	20:139	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001478	MF-109
DOE/MC/30127–					
3917	20:927	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001477	MF-113
DOE/METC/C–					
95/7158	20:17	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002406	MF-106; MF-114
95/7161	20:18	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002407	MF-103; MF-106
95/7162	20:1012	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002405	MF-110
DOE/MT/92008–					
8	20:128	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002763	MF-122
DOE/MT/92012–					
7	20:120	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000101	PC-122
DOE/MT/92018–					
3	20:65	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002765	MF-105
7	20:66	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002764	MF-105
DOE/MT/92021–					
7	20:1490	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002768	MF-103
DOE/MT/93006–					
3	20:1491	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002767	MF-103
DOE/MWIP–					
30	20:240	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003025	MF-2020
DOE/NE/32112–					
T6	20:608	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011553	MF-517
DOE/NV–					
382	20:928	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002817	MF-700

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/NV/10162–					
21	20:1850	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001439	MF-703
DOE/NV/11432–					
123-Vol.1	20:241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003021	MF-600
123-Vol.2	20:453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003022	MF-600
162	20:1789	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001495	MF-702
DOE/NV/11502–					
T2	20:1621	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002197	MF-700
DOE/OR–					
01-1161/V1-D2/A1	20:242	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002055	MF-2050
01-1268/V1-D1	20:735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001697	MF-2010
01-1268/V2-D1	20:494	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001698	MF-2010
01-1273/V2-D1	20:495	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002067	MF-2010
01-1288-D2	20:1790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002301	MF-2010
01-1311-D1	20:243	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001772	MF-2020
01-1312-D1	20:244	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002298	MF-2020
01-1313-D1	20:245	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002302	MF-2020
01-1314-D1	20:246	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002297	MF-2020
DOE/OR/21400–					
94/C0354	20:1492	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018113	MF-113
DOE/OR/21755–					
T4	20:1791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002776	MF-511
DOE/OR/21865–					
1	20:454	OSTI; NTIS; INIS; U.S. Geological Survey, Books and Open-File Reports, Box 25425, Federal Center, Denver, CO 80225; GPO Dep.	E 1.99:	DE95001701	MF-2010
DOE/PC/88819–					
T12	20:20	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001948	MF-108
T13	20:21	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001962	MF-108
T14	20:22	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001963	MF-108
T15	20:23	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001964	MF-108
T16	20:24	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001965	MF-108
T17	20:25	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001966	MF-108
T8	20:19	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001205	MF-108
DOE/PC/89651–					
T14	20:84	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001956	MF-105
DOE/PC/89653–					
T15	20:85	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001935	MF-105
T16	20:86	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001936	MF-105
DOE/PC/89769–					
T17	20:87	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001958	MF-103
DOE/PC/90057–					
T3	20:26	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001937	MF-108
T4	20:27	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001938	MF-108
T5	20:28	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001939	MF-108
T6	20:29	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001940	MF-108
T7	20:30	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001941	MF-108
T8	20:31	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001942	MF-108
DOE/PC/90181–					
T12	20:1671	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001955	MF-115
DOE/PC/90293–					
T14	20:32	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001961	MF-113
DOE/PC/90311–					
14	20:1	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002430	MF-117
15	20:2	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002431	MF-117
16	20:1297	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002641	MF-117
DOE/PC/90548–					
T13	20:67	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001952	MF-105
DOE/PC/91034–					
T9	20:33	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002620	MF-108
DOE/PC/91043–					
T12	20:3	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002633	MF-108

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
DOE/PC/91047–					
T9	20:54	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001949	MF-113
DOE/PC/91160–					
T3	20:88	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001953	MF-103
DOE/PC/91284–					
11	20:55	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002432	MF-117
DOE/PC/91297–					
T7	20:78	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002627	MF-117
DOE/PC/91304–					
T11	20:34	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001946	MF-108
DOE/PC/91308–					
10	20:89	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012615	MF-104
DOE/PC/91310–					
T11	20:35	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002429	MF-113
DOE/PC/91343–					
T6	20:736	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002425	MF-105
DOE/PC/91346–					
7	20:737	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001968	MF-105
DOE/PC/92112–					
T6	20:631	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002420	MF-108
T7	20:632	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002639	MF-108
DOE/PC/92118–					
T7	20:36	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002636	MF-108
DOE/PC/92120–					
T5	20:37	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002640	MF-108
DOE/PC/92152–					
T11	20:1493	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001945	MF-117
DOE/PC/92159–					
T8	20:738	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002421	MF-113
DOE/PC/92206–					
T5	20:4	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002422	MF-102
DOE/PC/92246–					
T5	20:5	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002621	MF-113
DOE/PC/92521–					
T131	20:38	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012558	MF-105
T151	20:56	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012578	MF-105
DOE/PC/92527–					
T7	20:57	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001943	MF-108
DOE/PC/92535–					
T7	20:739	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002424	MF-104; MF-105
DOE/PC/92539–					
8	20:1423	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002642	MF-103
DOE/PC/92542–					
T7	20:90	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002624	MF-114
DOE/PC/93205–					
T4	20:39	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002628	MF-108
DOE/PC/93214–					
T4	20:68	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002427	MF-105
DOE/PC/93215–					
T3	20:40	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001960	MF-102
DOE/PC/93224–					
T4	20:41	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002625	MF-108
DOE/PC/93227–					
T3	20:69	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002632	MF-105
DOE/PC/94118–					
T1	20:91	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002629	MF-104
DOE/PC/94224–					
T1	20:1177	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001947	MF-114
DOE/RL–					
94-113	20:548	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001852	MF-2050
94-124	20:549	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002584	MF-900
94-130	20:247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002967	MF-2000
94-36-2	20:455	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002950	MF-2010
94-68	20:190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002477	MF-2000
DOE/RW–					
0431	20:191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002271	MF-812

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
0450	20:249	OSTI (Free of Charge); INIS		TI95001712	MF-814
DOE/RW/00134–					
T14	20:248	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002190	MF-814
DOE/SF/18852–					
T44	20:609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001492	MF-528
DOE/SF/19202–					
T1	20:2281	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002132	MF-706
DOE/WIPP–					
94-1020	20:250	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002832	MF-2000
94-2018	20:251	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002831	MF-2000
94-2027	20:252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002833	MF-2010
DPST–					
86-314	20:253	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002683	MF-702
DPW–					
53-1146-Del.Ver.	20:841	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002284	MF-700
53-1247-Del.Ver.	20:815	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001998	MF-700
53-1307-Del.Ver.	20:152	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001996	MF-700
53-1311	20:842	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002433	MF-700
53-1322	20:836	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002387	MF-706
53-1343-Del.Ver.	20:153	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002541	MF-700
53-1362-Del.Ver.	20:825	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002286	MF-706
53-1402-Del.Ver.	20:872	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001670	MF-700
53-1413	20:942	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001669	MF-700
54-200-Del.Ver.	20:843	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001997	MF-700
54-21-1-Del.Ver.	20:154	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001995	MF-700
55-15-5	20:844	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002383	MF-700
55-15-12	20:254	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002382	MF-700
55-16-41	20:845	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002385	MF-706
55-17-4	20:846	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002576	MF-700
55-17-9	20:847	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002574	MF-700
55-17-10	20:848	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002575	MF-700
55-17-11	20:849	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002567	MF-700
55-17-12	20:850	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002568	MF-700
55-17-13	20:851	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002569	MF-700
55-17-14	20:852	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002570	MF-700
55-17-15	20:155	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002571	MF-700
55-17-17	20:156	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002562	MF-700
55-17-18	20:853	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002563	MF-700
55-17-19	20:157	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002564	MF-700
55-17-21	20:854	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002380	MF-700
55-17-22	20:855	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002381	MF-700
55-4-6	20:165	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002565	MF-700
55-4-7	20:166	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002566	MF-700
55-4-12	20:167	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002501	MF-700
55-4-13	20:168	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002493	MF-700
55-4-14	20:169	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002494	MF-700
55-4-17	20:170	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002502	MF-700
55-4-18	20:171	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002542	MF-700
55-4-19	20:172	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002543	MF-700
55-4-21	20:173	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002544	MF-700
55-4-29	20:174	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002551	MF-700
55-4-32	20:175	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002552	MF-700
55-4-33	20:176	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002553	MF-700
55-4-34	20:177	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002554	MF-700
55-4-36	20:178	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002555	MF-700
55-4-38	20:179	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002539	MF-700
55-4-39	20:180	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002540	MF-700
55-4-41	20:181	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002557	MF-700
55-4-42	20:182	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002558	MF-700
55-4-43	20:183	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002559	MF-700
55-4-44	20:184	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002560	MF-700
56-371	20:1434	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017646	MF-700
56-394	20:742	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017642	MF-706
DTH-LBM-TR–					
94-297	20:1017	OSTI; NTIS		DE95707362	
ECN-RX–					
93-082	20:1113	OSTI; NTIS; INIS		DE95711438	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
EGG–					
2596-Vol.6	20:877	*See* NUREG/CR–5535-Vol.6			
2738	20:1874	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002040	MF-408
EGG-CIET–					
11399	20:1792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002009	
EGG-EP–					
11237-Qtr1	20:1077	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001925	MF-1501
11320	20:1078	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002049	MF-1501
EGG-EST–					
9222-Vol.1	20:1793	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001909	
EGG-FSP–					
11193	20:2434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002012	MF-420
11307	20:2435	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001907	MF-420; MF-405
11348	20:2436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002038	MF-421
11386	20:2437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002037	MF-421
EGG-GEO–					
10797-Rev.2	20:1794	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.	E 1.99:	DE95002006	MF-2010
EGG-M–					
94222	20:816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002010	MF-2070
94237	20:255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001902	MF-2070
94273	20:256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002030	MF-2070
EGG-NRE–					
10754	20:496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002277	MF-2000
11406	20:801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001903	MF-413
11451	20:257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002035	MF-2070
11452	20:258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002005	MF-2000
EGG-PIR–					
10633(2Q-94)	20:497	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001908	MF-2000
10633(4Q-93)	20:456	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001973	MF-2000
EGG-RAAM–					
11041	20:802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001974	
11088	20:803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002032	
11376	20:1915	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO Dep.	E 1.99:	DE95002004	MF-2050
EGG-WM–					
11250	20:259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002050	MF-2010
11342	20:260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001905	MF-2020
11479	20:261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001921	MF-2000
EGG-WTD–					
10640	20:262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002048	MF-2020
10651	20:263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001926	MF-2070
10981-Vol.1	20:264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002027	MF-2020
10981-Vol.2	20:265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002028	MF-2020
11136	20:266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001916	MF-2000
11137	20:267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002047	MF-2020
11138	20:268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001977	MF-2000
11156	20:498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001904	MF-2000

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
11185	20:269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001390	MF-2060
11403	20:1042	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002036	MF-2000
11424	20:270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002008	MF-2070
ENDF–					
356	20:2266	*See* LA–12639-MS			
ENSLAPP-L–					
469/94.	20:2036	*See* IC–94/108			
EPD-SGS–					
94-307	20:271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002688	MF-702
ER–					
40685-766.	20:2157	*See* IC–93/216			
ES/ER/TM–					
104	20:500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002295	MF-2050
120/V1	20:1795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001384	MF-2000
120/V2	20:1796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001385	MF-2000
58	20:499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001870	MF-2000
86/R1	20:457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002293	MF-2000
ES/IMS–					
1	20:2569	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001069	MF-400
ESH-EMS–					
94-0514	20:458	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002835	MF-702
ESL–					
93033-TR	20:1779	*See* DOE/ER/14083–2			
ESTSC–					
000165IBMPC07	20:2537	ESTSC			
000188IBMPC00	20:2538	ESTSC			
ETDE/DE-mf–					
95707742	20:72	OSTI; NTIS (US Sales Only)		DE95707742	
95707779	20:73	OSTI; NTIS (US Sales Only)		DE95707779	
95707780	20:74	OSTI; NTIS (US Sales Only)		DE95707780	
95708529	20:719	OSTI; NTIS (US Sales Only)		DE95708529	
95708532	20:703	OSTI; NTIS (US Sales Only)		DE95708532	
95708584	20:730	OSTI; NTIS (US Sales Only)		DE95708584	
95708589	20:1114	OSTI; NTIS (US Sales Only)		DE95708589	
95708674	20:1018	OSTI; NTIS (US Sales Only)		DE95708674	
95708676	20:1062	OSTI; NTIS (US Sales Only)		DE95708676	
95708677	20:893	OSTI; NTIS (US Sales Only)		DE95708677	
95708707	20:1467	OSTI; NTIS (US Sales Only)		DE95708707	
95708708	20:1468	OSTI; NTIS (US Sales Only)		DE95708708	
95708739	20:1043	OSTI; NTIS (US Sales Only)		DE95708739	
95708760	20:1469	OSTI; NTIS (US Sales Only)		DE95708760	
95708762	20:978	OSTI; NTIS (US Sales Only)		DE95708762	
95708767	20:905	OSTI; NTIS (US Sales Only)		DE95708767	
95708780	20:618	OSTI; NTIS (US Sales Only)		DE95708780	
95708791	20:902	OSTI; NTIS (US Sales Only)		DE95708791	
95708793	20:982	OSTI; NTIS (US Sales Only)		DE95708793	
95711698	20:987	OSTI; NTIS (US Sales Only)		DE95711698	
95711726	20:903	OSTI; NTIS (US Sales Only)		DE95711726	
95711729	20:1115	OSTI; NTIS (US Sales Only)		DE95711729	
95711740	20:1116	OSTI; NTIS (US Sales Only)		DE95711740	
95711745	20:704	OSTI; NTIS (US Sales Only)		DE95711745	
95711746	20:75	OSTI; NTIS (US Sales Only)		DE95711746	
95711753	20:720	OSTI; NTIS (US Sales Only)		DE95711753	
95711759	20:1664	OSTI; NTIS (US Sales Only)		DE95711759	
95711760	20:1117	OSTI; NTIS (US Sales Only)		DE95711760	
95711772	20:683	OSTI; NTIS (US Sales Only)		DE95711772	
95711804	20:1118	OSTI; NTIS (US Sales Only)		DE95711804	
95715039	20:1741	OSTI; NTIS (US Sales Only)		DE95715039	
95715690	20:616	OSTI; NTIS (US Sales Only)		DE95715690	
95716027	20:1494	OSTI; NTIS (US Sales Only)		DE95716027	
95716122	20:1058	OSTI; NTIS (US Sales Only)		DE95716122	
95716137	20:1044	OSTI; NTIS (US Sales Only)		DE95716137	
95716173	20:1470	OSTI; NTIS (US Sales Only)		DE95716173	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95716174	20:1471	OSTI; NTIS (US Sales Only)		DE95716174	
95716175	20:983	OSTI; NTIS (US Sales Only)		DE95716175	
95716184	20:917	OSTI; NTIS (US Sales Only)		DE95716184	
95716211	20:705	OSTI; NTIS (US Sales Only)		DE95716211	
95716227	20:1742	OSTI; NTIS (US Sales Only)		DE95716227	
95716229	20:988	OSTI; NTIS (US Sales Only)		DE95716229	
95716230	20:94	OSTI; NTIS (US Sales Only)		DE95716230	
95716297	20:1019	OSTI; NTIS (US Sales Only)		DE95716297	
95716303	20:70	OSTI; NTIS (US Sales Only)		DE95716303	
95716304	20:1088	OSTI; NTIS (US Sales Only)		DE95716304	
95716305	20:1045	OSTI; NTIS (US Sales Only)		DE95716305	
95716306	20:124	OSTI; NTIS (US Sales Only)		DE95716306	
95716307	20:121	OSTI; NTIS (US Sales Only)		DE95716307	
95716308	20:76	OSTI; NTIS (US Sales Only)		DE95716308	
95716313	20:1079	OSTI; NTIS (US Sales Only)		DE95716313	
95716314	20:984	OSTI; NTIS (US Sales Only)		DE95716314	
95716315	20:129	OSTI; NTIS (US Sales Only)		DE95716315	
95716317	20:77	OSTI; NTIS (US Sales Only)		DE95716317	
95716319	20:1346	OSTI; NTIS (US Sales Only)		DE95716319	
95716321	20:1064	OSTI; NTIS (US Sales Only)		DE95716321	
95716322	20:740	OSTI; NTIS (US Sales Only)		DE95716322	
95716323	20:617	OSTI; NTIS (US Sales Only)		DE95716323	
95716324	20:1743	OSTI; NTIS (US Sales Only)		DE95716324	
95716326	20:1082	OSTI; NTIS (US Sales Only)		DE95716326	
95716327	20:721	OSTI; NTIS (US Sales Only)		DE95716327	
95716328	20:1895	OSTI; NTIS (US Sales Only)		DE95716328	
95716329	20:1744	OSTI; NTIS (US Sales Only)		DE95716329	
95716331	20:1065	OSTI; NTIS (US Sales Only)		DE95716331	
95716343	20:999	OSTI; NTIS (US Sales Only)		DE95716343	
95716344	20:1499	OSTI; NTIS (US Sales Only)		DE95716344	
95716345	20:2570	OSTI; NTIS (US Sales Only)		DE95716345	
95716348	20:1066	OSTI; NTIS (US Sales Only)		DE95716348	
95716349	20:619	OSTI; NTIS (US Sales Only)		DE95716349	
95716354	20:621	OSTI; NTIS (US Sales Only)		DE95716354	
95716357	20:1059	OSTI; NTIS (US Sales Only)		DE95716357	
95716359	20:1067	OSTI; NTIS (US Sales Only)		DE95716359	
95716360	20:1435	OSTI; NTIS (US Sales Only)		DE95716360	
95716362	20:1436	OSTI; NTIS (US Sales Only)		DE95716362	
95716363	20:901	OSTI; NTIS (US Sales Only)		DE95716363	
95716365	20:693	OSTI; NTIS (US Sales Only)		DE95716365	
95716369	20:1084	OSTI; NTIS (US Sales Only)		DE95716369	
95716373	20:622	OSTI; NTIS (US Sales Only)		DE95716373	
95716379	20:731	OSTI; NTIS (US Sales Only)		DE95716379	
95716383	20:1472	OSTI; NTIS (US Sales Only)		DE95716383	
95716385	20:1473	OSTI; NTIS (US Sales Only)		DE95716385	
ETDE/JP-mf–					
95714434	20:1068	OSTI; NTIS; Available from Society of Automotive Engineers of Japan, Inc., 10-2, Gobancho, Chiyoda-ku, Tokyo, Japan		DE95714434	
95714822	20:42	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714822	
95714824	20:711	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714824	
95714825	20:93	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714825	
95714826	20:43	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714826	
95714827	20:44	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714827	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95714828	20:45	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714828	
95714830	20:46	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714830	
95714831	20:47	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714831	
FNAL-TM–					
1878	20:1534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002531	MF-414
1896	20:1535	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002528	MF-406
1902	20:1549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002212	MF-414
94/1903	20:1533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002529	MF-414
FNAL/C–					
94-274-E	20:2151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002217	MF-414
94-336-E	20:2153	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002216	MF-414
94/213	20:1548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002251	MF-414
94/216-E	20:2150	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002521	MF-414
94/219-E	20:2237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002248	MF-414
94/253	20:1532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002527	MF-414
94/281-E	20:1622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002533	MF-414
94/284-E	20:1623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002249	MF-414
94/314-E	20:2191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002524	MF-414
94/320-E	20:1624	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002218	MF-414
94/325-E	20:2152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002525	MF-414
94/340-E	20:1625	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002526	MF-414
94/341-E	20:2154	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002250	MF-414
94/342-E	20:1626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002532	MF-414
94/343-E	20:2155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002522	MF-414
94/345-E	20:2156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002523	MF-414
FNAL/Pub–					
94/179-T	20:2149	*See* DOE/ER/40561–137			
FRCEA-TH–					
405	20:1627	OSTI; NTIS (US Sales Only); INIS		DE95606725	
408	20:1298	OSTI; NTIS (US Sales Only); INIS		DE95603231	
FRNC-TH–					
3738	20:2539	OSTI; NTIS (US Sales Only); INIS		DE95606979	
3740	20:1659	OSTI; NTIS (US Sales Only); INIS		DE95606757	
FZR–					
36	20:2313	OSTI; NTIS (US Sales Only); INIS		DE95716126	
49(prepr.)	20:2082	OSTI; NTIS (US Sales Only); INIS		DE95715031	
50(prepr.)	20:2238	OSTI; NTIS (US Sales Only); INIS		DE95715033	
53	20:1628	OSTI; NTIS (US Sales Only); INIS		DE95715035	
GA-A–					
21720	20:770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000722	MF-522
21778	20:2408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001389	MF-421
GANIL-T–					
93-04	20:2228	OSTI; NTIS (US Sales Only); INIS		DE95607368	
GC–					
38/2	20:2461	OSTI; NTIS (US Sales Only); INIS		DE95605238	
38/INF/3	20:2462	OSTI; NTIS (US Sales Only); INIS		DE95605237	
GESP–					
7230	20:608	*See* DOE/NE/32112–T6			
GKSS–					
94/E/8	20:1745	OSTI; NTIS (US Sales Only)		DE95707482	
94/E/9	20:1746	OSTI; NTIS (US Sales Only)		DE95715240	
GL–					
4979	20:1482	*See* DOE/ER/13797–T1			
GSI–					
93-43	20:1550	OSTI; NTIS (US Sales Only); INIS		DE95711708	
94-04	20:1629	OSTI; NTIS (US Sales Only); INIS		DE95711703	
94-05	20:1603	OSTI; NTIS (US Sales Only); INIS		DE95716231	
94-06	20:2225	OSTI; NTIS (US Sales Only); INIS		DE95711700	
94-11	20:1551	OSTI; NTIS (US Sales Only); INIS		DE95711428	
94-46(prepr.)	20:2239	OSTI; NTIS (US Sales Only); INIS		DE95715735	
94-47(prepr.)	20:2226	OSTI; NTIS (US Sales Only); INIS		DE95711377	
94-52(prepr.)	20:2227	OSTI; NTIS (US Sales Only); INIS		DE95715282	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-53(prepr.)	20:2083	OSTI; NTIS (US Sales Only); INIS		DE95711146	
94-54(prepr.)	20:2240	OSTI; NTIS (US Sales Only); INIS		DE95711147	
94-56(prepr.)	20:2207	OSTI; NTIS (US Sales Only); INIS		DE95715043	
94-58(prepr.)	20:1630	OSTI; NTIS (US Sales Only); INIS		DE95715044	
94-59(prepr.)	20:1299	OSTI; NTIS (US Sales Only); INIS		DE95715045	
94-60(prepr.)	20:2241	OSTI; NTIS (US Sales Only); INIS		DE95715046	
HAN–					
93855-Rpt.7-Del.	20:158	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015449	MF-500
HEP-LAT–					
9408017	20:2078	*See* DESY–94-145			
HEP-PH–					
9407330.	20:2084	*See* IC–94/64			
9409280	20:2207	*See* GSI–94-56(prepr.)			
HEP-TH–					
9306088.	20:2068	*See* UM-P–93/38			
9407015.	20:2043	*See* IC–94/147			
9407079	20:2032	*See* DESY–94-116			
HEPTH–					
9408063.	20:2037	*See* IC–94/116			
HIFAN–					
667	20:1523	*See* LBL–35966			
671	20:2445	*See* LBL–36067			
HMI-B–					
509	20:1660	OSTI; NTIS (US Sales Only); INIS		DE95708631	
521	20:2463	OSTI; NTIS (US Sales Only); INIS		DE95711376	
HW–					
68474	20:856	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017447	MF-500
68934	20:857	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018249	MF-520
69000-V2A	20:826	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001338	MF-500
83932	20:858	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001340	MF-500
HW-SA–					
2984	20:859	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016755	MF-700
IAEA-CN–					
60/A-3-I-3	20:2422	*See* PPPL-CFP–3163			
60/E-P-3	20:2423	*See* PPPL-CFP–3167			
IAEA-INFCIRC–					
209(rev.1/add.3)	20:550	OSTI; NTIS (US Sales Only); INIS		DE95604201	
254(rev.1/pt.1/Mod.1/.1)	20:568	OSTI; NTIS (US Sales Only); INIS		DE95605202	
254(rev.1/pt.1/mod.2)	20:569	OSTI; NTIS (US Sales Only); INIS		DE95605203	
433	20:570	OSTI; NTIS (US Sales Only); INIS		DE95605204	
438	20:571	OSTI; NTIS (US Sales Only); INIS		DE95605205	
440	20:572	OSTI; NTIS (US Sales Only); INIS		DE95605206	
441	20:573	OSTI; NTIS (US Sales Only); INIS		DE95605207	
442	20:574	OSTI; NTIS (US Sales Only); INIS		DE95605208	
443	20:551	OSTI; NTIS (US Sales Only); INIS		DE95605216	
444	20:552	OSTI; NTIS (US Sales Only); INIS		DE95605217	
446	20:553	OSTI; NTIS (US Sales Only); INIS		DE95605215	
448	20:1096	OSTI; NTIS (US Sales Only); INIS		DE95605209	
449	20:2574	OSTI; NTIS (US Sales Only); INIS		DE95604197	
449/add.1	20:2575	OSTI; NTIS (US Sales Only); INIS		DE95604198	
450	20:575	OSTI; NTIS (US Sales Only); INIS		DE95605210	
451	20:576	OSTI; NTIS (US Sales Only); INIS		DE95605211	
452	20:577	OSTI; NTIS (US Sales Only); INIS		DE95605212	
IAEA-NDS–					
7(rev.94/3)	20:2571	OSTI; NTIS (US Sales Only); INIS		DE95605213	
IAEA-TECDOC–					
753	20:796	OSTI; NTIS (US Sales Only); INIS		DE95604081	
756	20:743	OSTI; NTIS (US Sales Only); INIS		DE95603883	
759	20:192	OSTI; NTIS (US Sales Only); INIS		DE95606401	
IAEA/NENP/TC–					
93/1	20:827	OSTI; NTIS (US Sales Only); INIS		DE95605239	
93/2	20:828	OSTI; NTIS (US Sales Only); INIS		DE95604199	
IAERU–					
9304	20:1411	OSTI; NTIS; INIS		DE95709895	
IC–					
93/216	20:2157	OSTI; NTIS (US Sales Only); INIS		DE95607181	
93/424	20:2282	OSTI; NTIS (US Sales Only); INIS		DE95607520	
94/101	20:640	OSTI; NTIS (US Sales Only); INIS		DE95606029	
94/104	20:1797	OSTI; NTIS (US Sales Only); INIS		DE95606006	
94/105	20:1798	OSTI; NTIS (US Sales Only); INIS		DE95606007	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94/107	20:1978	OSTI; NTIS (US Sales Only); INIS		DE95606997	
94/108	20:2036	OSTI; NTIS (US Sales Only); INIS		DE95607073	
94/116	20:2037	OSTI; NTIS (US Sales Only); INIS		DE95607074	
94/119	20:2085	OSTI; NTIS (US Sales Only); INIS		DE95607143	
94/128	20:1979	OSTI; NTIS (US Sales Only); INIS		DE95606998	
94/129	20:2388	OSTI; NTIS (US Sales Only); INIS		DE95607840	
94/130	20:2038	OSTI; NTIS (US Sales Only); INIS		DE95607075	
94/131	20:2039	OSTI; NTIS (US Sales Only); INIS		DE95607076	
94/132	20:2040	OSTI; NTIS (US Sales Only); INIS		DE95607077	
94/133	20:2364	OSTI; NTIS (US Sales Only); INIS		DE95607819	
94/134	20:2409	OSTI; NTIS (US Sales Only); INIS		DE95607626	
94/135	20:1980	OSTI; NTIS (US Sales Only); INIS		DE95606999	
94/136	20:1981	OSTI; NTIS (US Sales Only); INIS		DE95607000	
94/137	20:2298	OSTI; NTIS (US Sales Only); INIS		DE95607661	
94/138	20:2299	OSTI; NTIS (US Sales Only); INIS		DE95607662	
94/139	20:2361	OSTI; NTIS (US Sales Only); INIS		DE95607804	
94/140	20:641	OSTI; NTIS (US Sales Only); INIS		DE95606030	
94/141	20:1747	OSTI; NTIS (US Sales Only); INIS		DE95606031	
94/142	20:2410	OSTI; NTIS (US Sales Only); INIS		DE95607598	
94/143	20:1982	OSTI; NTIS (US Sales Only); INIS		DE95607001	
94/144	20:2041	OSTI; NTIS (US Sales Only); INIS		DE95607078	
94/145	20:2300	OSTI; NTIS (US Sales Only); INIS		DE95607663	
94/146	20:2042	OSTI; NTIS (US Sales Only); INIS		DE95607079	
94/147	20:2043	OSTI; NTIS (US Sales Only); INIS		DE95607080	
94/148	20:2297	OSTI; NTIS (US Sales Only); INIS		DE95607577	
94/149	20:1347	OSTI; NTIS (US Sales Only); INIS		DE95605639	
94/151	20:2390	OSTI; NTIS (US Sales Only); INIS		DE95607844	
94/152	20:1983	OSTI; NTIS (US Sales Only); INIS		DE95607002	
94/153	20:1984	OSTI; NTIS (US Sales Only); INIS		DE95607003	
94/154	20:2158	OSTI; NTIS (US Sales Only); INIS		DE95607173	
94/155	20:2086	OSTI; NTIS (US Sales Only); INIS		DE95607121	
94/156	20:2044	OSTI; NTIS (US Sales Only); INIS		DE95607081	
94/157	20:2411	OSTI; NTIS (US Sales Only); INIS		DE95607608	
94/158	20:1985	OSTI; NTIS (US Sales Only); INIS		DE95607004	
94/159	20:2365	OSTI; NTIS (US Sales Only); INIS		DE95607820	
94/160	20:2389	OSTI; NTIS (US Sales Only); INIS		DE95607841	
94/161	20:2012	OSTI; NTIS (US Sales Only); INIS		DE95607043	
94/163	20:2192	OSTI; NTIS (US Sales Only); INIS		DE95607201	
94/165	20:1986	OSTI; NTIS (US Sales Only); INIS		DE95607005	
94/166	20:718	OSTI; NTIS (US Sales Only); INIS		DE95606032	
94/167	20:1748	OSTI; NTIS (US Sales Only); INIS		DE95606033	
94/168	20:2045	OSTI; NTIS (US Sales Only); INIS		DE95607082	
94/169	20:2087	OSTI; NTIS (US Sales Only); INIS		DE95607144	
94/171	20:1987	OSTI; NTIS (US Sales Only); INIS		DE95607006	
94/173	20:2046	OSTI; NTIS (US Sales Only); INIS		DE95607083	
94/174	20:2159	OSTI; NTIS (US Sales Only); INIS		DE95607188	
94/175	20:2013	OSTI; NTIS (US Sales Only); INIS		DE95607044	
94/177	20:2283	OSTI; NTIS (US Sales Only); INIS		DE95607521	
94/179	20:2047	OSTI; NTIS (US Sales Only); INIS		DE95607084	
94/180	20:2014	OSTI; NTIS (US Sales Only); INIS		DE95606045	
94/183	20:2362	OSTI; NTIS (US Sales Only); INIS		DE95607805	
94/184	20:2015	OSTI; NTIS (US Sales Only); INIS		DE95607045	
94/185	20:2048	OSTI; NTIS (US Sales Only); INIS		DE95607069	
94/186	20:2016	OSTI; NTIS (US Sales Only); INIS		DE95607046	
94/189	20:1988	OSTI; NTIS (US Sales Only); INIS		DE95607007	
94/190	20:2301	OSTI; NTIS (US Sales Only); INIS		DE95607664	
94/191	20:2088	OSTI; NTIS (US Sales Only); INIS		DE95607145	
94/192	20:1989	OSTI; NTIS (US Sales Only); INIS		DE95607008	
94/193	20:2049	OSTI; NTIS (US Sales Only); INIS		DE95607085	
94/195	20:2017	OSTI; NTIS (US Sales Only); INIS		DE95607047	
94/196	20:1348	OSTI; NTIS (US Sales Only); INIS		DE95605636	
94/200	20:2412	OSTI; NTIS (US Sales Only); INIS		DE95607599	
94/201	20:2050	OSTI; NTIS (US Sales Only); INIS		DE95607086	
94/202	20:2089	OSTI; NTIS (US Sales Only); INIS		DE95607124	
94/203	20:2160	OSTI; NTIS (US Sales Only); INIS		DE95607177	
94/204	20:1990	OSTI; NTIS (US Sales Only); INIS		DE95607009	
94/205	20:2343	OSTI; NTIS (US Sales Only); INIS		DE95607768	
94/207	20:2051	OSTI; NTIS (US Sales Only); INIS		DE95607087	
94/216	20:2052	OSTI; NTIS (US Sales Only); INIS		DE95607088	
94/53	20:1977	OSTI; NTIS (US Sales Only); INIS		DE95607010	
94/54	20:2010	OSTI; NTIS (US Sales Only); INIS		DE95607048	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94/55	20:2011	OSTI; NTIS (US Sales Only); INIS		DE95607049	
94/64	20:2084	OSTI; NTIS (US Sales Only); INIS		DE95607146	
94/84	20:2035	OSTI; NTIS (US Sales Only); INIS		DE95607070	
IFE/KR/E–					
94/003	20:797	OSTI; NTIS; INIS		DE95606818	
IFSR–					
667	20:2405	*See* DOE/ET/53088–667			
672	20:2009	*See* DOE/ET/53088–672			
IFUP-TH–					
39/94.	20:2044	*See* IC–94/156			
IKE–					
4-137	20:2451	OSTI; NTIS (US Sales Only)		DE95711707	
IKMz–					
94-1	20:1412	OSTI; NTIS (US Sales Only); INIS		DE95711682	
ILL-RA–					
1993	20:860	OSTI; NTIS (US Sales Only); INIS		DE95606629	
ILR-Mitt.–					
287(1994)	20:722	OSTI; NTIS (US Sales Only)		DE95707844	
IMSC–					
94-31	20:2037	*See* IC–94/116			
IN–					
326	20:1026	*See* LBL–36134			
INDC(NDS)–					
304	20:2242	OSTI; NTIS (US Sales Only); INIS		DE95607487	
INEL/MISC–					
92024	20:237	*See* DOE/LLW–139			
94045	20:1749	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001917	
94046	20:1750	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001918	
94047	20:1751	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001920	
94052	20:234	*See* DOE/ID–10054(93)			
94058	20:567	*See* DOE/LLW–206			
94059	20:1786	*See* DOE/LLW–207			
94060	20:236	*See* DOE/LLW–103-Rev.1			
94062	20:239	*See* DOE/LLW–188			
94063	20:235	*See* DOE/ID–10454			
94064	20:452	*See* DOE/LLW–212			
INIS-BR–					
3428	20:888	OSTI; NTIS (US Sales Only); INIS		DE95604191	
3429	20:889	OSTI; NTIS (US Sales Only); INIS		DE95604192	
3430	20:890	OSTI; NTIS (US Sales Only); INIS		DE95604193	
3431	20:2577	OSTI; NTIS (US Sales Only); INIS		DE95604200	
3432	20:2572	OSTI; NTIS (US Sales Only); INIS		DE95605214	
3433	20:1875	OSTI; NTIS (US Sales Only); INIS		DE95603767	
3434	20:1876	OSTI; NTIS (US Sales Only); INIS		DE95603768	
3435	20:1877	OSTI; NTIS (US Sales Only); INIS		DE95603769	
3436	20:1300	OSTI; NTIS (US Sales Only); INIS		DE95603146	
3437	20:1799	OSTI; NTIS (US Sales Only); INIS		DE95603493	
3443	20:1301	OSTI; NTIS (US Sales Only); INIS		DE95603147	
3444	20:143	OSTI; NTIS (US Sales Only); INIS		DE95603505	
3446	20:1552	OSTI; NTIS (US Sales Only); INIS		DE95606424	
INIS-GB–					
637	20:185	OSTI; NTIS (US Sales Only); INIS		DE95603379	
640	20:808	OSTI; NTIS (US Sales Only); INIS		DE95606475	
643	20:1483	OSTI; NTIS (US Sales Only); INIS		DE95606437	
644	20:1916	OSTI; NTIS (US Sales Only); INIS		DE95606166	
INIS-UA–					
005	20:1222	OSTI; NTIS (US Sales Only); INIS		DE95605766	
INIS-mf–					
13867	20:1880	OSTI; NTIS (US Sales Only); INIS		DE95603340	
13962	20:2438	OSTI; NTIS (US Sales Only); INIS		DE95607653	
13988	20:943	OSTI; NTIS (US Sales Only); INIS		DE95604093	
13989	20:944	OSTI; NTIS (US Sales Only); INIS		DE95604094	
13990	20:945	OSTI; NTIS (US Sales Only); INIS		DE95604095	
13991	20:946	OSTI; NTIS (US Sales Only); INIS		DE95604096	
13992	20:947	OSTI; NTIS (US Sales Only); INIS		DE95604097	
13993	20:948	OSTI; NTIS (US Sales Only); INIS		DE95604098	
13994	20:949	OSTI; NTIS (US Sales Only); INIS		DE95604099	
13995	20:950	OSTI; NTIS (US Sales Only); INIS		DE95604100	
13996	20:951	OSTI; NTIS (US Sales Only); INIS		DE95604101	
13997	20:952	OSTI; NTIS (US Sales Only); INIS		DE95604102	
13998	20:953	OSTI; NTIS (US Sales Only); INIS		DE95604103	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
13999	20:954	OSTI; NTIS (US Sales Only); INIS		DE95604104	
14301	20:955	OSTI; NTIS (US Sales Only); INIS		DE95604105	
14302	20:956	OSTI; NTIS (US Sales Only); INIS		DE95604106	
14303	20:957	OSTI; NTIS (US Sales Only); INIS		DE95604107	
14304	20:958	OSTI; NTIS (US Sales Only); INIS		DE95604108	
14305	20:959	OSTI; NTIS (US Sales Only); INIS		DE95604109	
14306	20:960	OSTI; NTIS (US Sales Only); INIS		DE95604110	
14307	20:961	OSTI; NTIS (US Sales Only); INIS		DE95604111	
14313	20:861	OSTI; NTIS (US Sales Only); INIS		DE95603392	
14318	20:1631	OSTI; NTIS (US Sales Only); INIS		DE95603949	
14319	20:1379	OSTI; NTIS (US Sales Only); INIS		DE95603356	
14320	20:276	OSTI; NTIS (US Sales Only); INIS		DE95604064	
14321	20:1414	OSTI; NTIS (US Sales Only); INIS		DE95603341	
14322	20:1415	OSTI; NTIS (US Sales Only); INIS		DE95603342	
14340	20:1380	OSTI; NTIS (US Sales Only); INIS		DE95605567	
14347	20:277	OSTI; NTIS (US Sales Only); INIS		DE95604074	
14348	20:278	OSTI; NTIS (US Sales Only); INIS		DE95604075	
14349	20:279	OSTI; NTIS (US Sales Only); INIS		DE95604076	
14350	20:280	OSTI; NTIS (US Sales Only); INIS		DE95604065	
14351	20:281	OSTI; NTIS (US Sales Only); INIS		DE95604077	
14352	20:282	OSTI; NTIS (US Sales Only); INIS		DE95604078	
14358	20:2513	OSTI; NTIS (US Sales Only); INIS		DE95605240	
14359	20:2514	OSTI; NTIS (US Sales Only); INIS		DE95605241	
14360	20:1918	OSTI; NTIS (US Sales Only); INIS		DE95605242	
14365	20:1381	OSTI; NTIS (US Sales Only); INIS		DE95603357	
14366	20:636	OSTI; NTIS (US Sales Only); INIS		DE95604166	
14367	20:891	OSTI; NTIS (US Sales Only); INIS		DE95604194	
14368	20:909	OSTI; NTIS (US Sales Only); INIS		DE95604117	
14369	20:798	OSTI; NTIS (US Sales Only); INIS		DE95604083	
14370	20:962	OSTI; NTIS (US Sales Only); INIS		DE95604084	
14371	20:892	OSTI; NTIS (US Sales Only); INIS		DE95604195	
14372	20:799	OSTI; NTIS (US Sales Only); INIS		DE95604085	
14374	20:586	OSTI; NTIS (US Sales Only); INIS		DE95603802	
14375	20:1635	OSTI; NTIS (US Sales Only); INIS		DE95603950	
14377	20:144	OSTI; NTIS (US Sales Only); INIS		DE95606001	
14378	20:1801	OSTI; NTIS (US Sales Only); INIS		DE95606009	
14379	20:145	OSTI; NTIS (US Sales Only); INIS		DE95606010	
14380	20:1802	OSTI; NTIS (US Sales Only); INIS		DE95605960	
14381	20:1803	OSTI; NTIS (US Sales Only); INIS		DE95605961	
14382	20:1804	OSTI; NTIS (US Sales Only); INIS		DE95605962	
14383	20:1805	OSTI; NTIS (US Sales Only); INIS		DE95605963	
14384	20:1806	OSTI; NTIS (US Sales Only); INIS		DE95605964	
14385	20:1417	OSTI; NTIS (US Sales Only); INIS		DE95605680	
14389	20:800	OSTI; NTIS; INIS		DE95606824	
14391	20:746	OSTI; NTIS (US Sales Only); INIS		DE95606515	
14392	20:587	OSTI; NTIS; INIS		DE95605953	
14393	20:1418	OSTI; NTIS; INIS		DE95605569	
15019	20:2452	OSTI; NTIS (US Sales Only); INIS		DE95716125	
15039	20:910	OSTI; NTIS (US Sales Only); INIS		DE95711767	
15040	20:989	OSTI; NTIS (US Sales Only); INIS		DE95711744	
15041	20:919	OSTI; NTIS (US Sales Only); INIS		DE95711742	
15043	20:920	OSTI; NTIS (US Sales Only); INIS		DE95711743	
15044	20:1140	OSTI; NTIS (US Sales Only); INIS		DE95711739	
15045	20:1853	OSTI; NTIS (US Sales Only); INIS		DE95711741	
15054	20:873	OSTI; NTIS (US Sales Only); INIS		DE95715139	
15055	20:1752	OSTI; NTIS (US Sales Only); INIS		DE95715075	
15056	20:1753	OSTI; NTIS (US Sales Only); INIS		DE95715050	
15057	20:1754	OSTI; NTIS (US Sales Only); INIS		DE95715049	
15058	20:1755	OSTI; NTIS (US Sales Only); INIS		DE95715074	
15061	20:1854	OSTI; NTIS (US Sales Only); INIS		DE95715689	
15062	20:1855	OSTI; NTIS (US Sales Only); INIS		DE95715691	
15063	20:1950	OSTI; NTIS (US Sales Only); INIS		DE95716290	
15064	20:1362	OSTI; NTIS (US Sales Only); INIS		DE95716302	
15065	20:1952	OSTI; NTIS (US Sales Only); INIS		DE95716296	
15066	20:732	OSTI; NTIS (US Sales Only); INIS		DE95716325	
15067	20:623	OSTI; NTIS (US Sales Only); INIS		DE95716366	
IPNO–					
93-02	20:1554	OSTI; NTIS (US Sales Only); INIS		DE95606425	
IPNO-DRE–					
93-16	20:1520	OSTI; NTIS (US Sales Only); INIS		DE95606419	
93-17	20:2243	OSTI; NTIS (US Sales Only); INIS		DE95607390	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93-20	20:2244	OSTI; NTIS (US Sales Only); INIS		DE95607395	
93-21	20:2245	OSTI; NTIS (US Sales Only); INIS		DE95607415	
93-22	20:2209	OSTI; NTIS (US Sales Only); INIS		DE95607216	
93-23	20:2210	OSTI; NTIS (US Sales Only); INIS		DE95607217	
93-24	20:2211	OSTI; NTIS (US Sales Only); INIS		DE95607218	
93-25	20:2359	OSTI; NTIS (US Sales Only); INIS		DE95607772	
93-28	20:2246	OSTI; NTIS (US Sales Only); INIS		DE95607427	
93-30	20:2247	OSTI; NTIS (US Sales Only); INIS		DE95607428	
93-32	20:2248	OSTI; NTIS (US Sales Only); INIS		DE95607429	
93-33	20:2249	OSTI; NTIS (US Sales Only); INIS		DE95607430	
94-02	20:2250	OSTI; NTIS (US Sales Only); INIS		DE95607416	
94-03	20:2212	OSTI; NTIS (US Sales Only); INIS		DE95607306	
94-04	20:284	OSTI; NTIS (US Sales Only); INIS		DE95606777	
94-07	20:2251	OSTI; NTIS (US Sales Only); INIS		DE95607432	
94-09	20:2252	OSTI; NTIS (US Sales Only); INIS		DE95607417	
94-10	20:2161	OSTI; NTIS (US Sales Only); INIS		DE95607184	
IPNO-TH–					
91-9I	20:2193	OSTI; NTIS (US Sales Only); INIS		DE95607199	
92-109	20:2162	OSTI; NTIS (US Sales Only); INIS		DE95607156	
93-03	20:2020	OSTI; NTIS (US Sales Only); INIS		DE95607050	
93-07	20:2213	OSTI; NTIS (US Sales Only); INIS		DE95607307	
93-11	20:1992	OSTI; NTIS (US Sales Only); INIS		DE95607011	
93-14	20:2214	OSTI; NTIS (US Sales Only); INIS		DE95607308	
93-16	20:2021	OSTI; NTIS (US Sales Only); INIS		DE95607051	
93-17	20:2194	OSTI; NTIS (US Sales Only); INIS		DE95607210	
93-24	20:2363	OSTI; NTIS (US Sales Only); INIS		DE95607806	
93-25	20:2090	OSTI; NTIS (US Sales Only); INIS		DE95607125	
93-29	20:2022	OSTI; NTIS (US Sales Only); INIS		DE95607052	
93-31	20:2163	OSTI; NTIS (US Sales Only); INIS		DE95607178	
93-34	20:2023	OSTI; NTIS (US Sales Only); INIS		DE95607053	
93-37	20:2091	OSTI; NTIS (US Sales Only); INIS		DE95607138	
93-38	20:2195	OSTI; NTIS (US Sales Only); INIS		DE95607211	
93-41	20:2092	OSTI; NTIS (US Sales Only); INIS		DE95607132	
93-44	20:1993	OSTI; NTIS (US Sales Only); INIS		DE95607012	
93-47	20:2164	OSTI; NTIS (US Sales Only); INIS		DE95607182	
93-52	20:2396	OSTI; NTIS (US Sales Only); INIS		DE95607845	
93-60	20:2024	OSTI; NTIS (US Sales Only); INIS		DE95607054	
93-62	20:1994	OSTI; NTIS (US Sales Only); INIS		DE95607013	
93-63	20:1995	OSTI; NTIS (US Sales Only); INIS		DE95607014	
93-66	20:2215	OSTI; NTIS (US Sales Only); INIS		DE95607309	
93-68	20:2093	OSTI; NTIS (US Sales Only); INIS		DE95607139	
93-71	20:1996	OSTI; NTIS (US Sales Only); INIS		DE95607015	
93-72	20:2165	OSTI; NTIS (US Sales Only); INIS		DE95607179	
93-74	20:1997	OSTI; NTIS (US Sales Only); INIS		DE95607016	
94-05	20:2053	OSTI; NTIS (US Sales Only); INIS		DE95607089	
94-07	20:2542	OSTI; NTIS (US Sales Only); INIS		DE95606980	
94-08	20:2166	OSTI; NTIS (US Sales Only); INIS		DE95607192	
94-09	20:2216	OSTI; NTIS (US Sales Only); INIS		DE95607220	
94-14	20:1998	OSTI; NTIS (US Sales Only); INIS		DE95607017	
IS–					
5103	20:879	*See* NUREG/CR–6161			
IS-M–					
795	20:1143	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001681	MF-404
796	20:1144	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001680	MF-404
797	20:2384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001682	MF-406
798	20:48	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001665	MF-108
799	20:49	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001679	MF-401
803	20:1232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001684	MF-414
804	20:71	OSTI; NTIS; GPO Dep.	E 1.99:	DE94012300	MF-109
806	20:1280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001678	MF-404
IS-T–					
1538	20:1145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001664	MF-404
1621	20:1233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001677	MF-404
1689	20:1146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001654	MF-411
1696	20:1327	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001673	MF-401
1698	20:1363	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001656	MF-401
1699	20:1364	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001675	MF-401
1701	20:1328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001676	MF-401
1709	20:2294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001687	MF-411
1710	20:1865	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001672	MF-408
1712	20:1329	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001663	MF-401

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
1713	20:1370	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001653	MF-401
ISN–					
94-54.	20:2002	*See* LYCEN–9420			
ITF–					
93-38	20:2094	OSTI; NTIS (US Sales Only); INIS		DE95607133	
94-3	20:2229	OSTI; NTIS (US Sales Only); INIS		DE95607370	
94-4	20:2413	OSTI; NTIS (US Sales Only); INIS		DE95607609	
ITP–					
92-17	20:1234	OSTI; NTIS (US Sales Only); INIS		DE95605851	
93-23	20:2230	OSTI; NTIS (US Sales Only); INIS		DE95607371	
93-64	20:2054	OSTI; NTIS (US Sales Only); INIS		DE95607090	
94-1	20:1235	OSTI; NTIS (US Sales Only); INIS		DE95605886	
94-2	20:2217	OSTI; NTIS (US Sales Only); INIS		DE95607310	
94-5	20:2218	OSTI; NTIS (US Sales Only); INIS		DE95607221	
94-8	20:2414	OSTI; NTIS (US Sales Only); INIS		DE95607611	
94-9	20:2415	OSTI; NTIS (US Sales Only); INIS		DE95607612	
94-10	20:2416	OSTI; NTIS (US Sales Only); INIS		DE95607610	
ITRI–					
143	20:501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002969	MF-630
IVO-A–					
10/93	20:764	OSTI; NTIS; INIS		DE95606554	
JAERI-Conf–					
94-003	20:1512	OSTI; NTIS; INIS		DE95709882	
JAERI-Data/Code–					
94-006	20:765	OSTI; NTIS; INIS		DE95709892	
JAERI-M–					
94-038	20:2439	OSTI; NTIS; INIS		DE95709764	
JAERI-Research–					
94-003	20:749	OSTI; NTIS; INIS		DE95709889	
94-006	20:817	OSTI; NTIS; INIS		DE95709893	
JAERI-Tech–					
94-004	20:862	OSTI; NTIS; INIS		DE95709890	
94-005	20:1439	OSTI; NTIS; INIS		DE95709891	
94-010	20:818	OSTI; NTIS; INIS		DE95709888	
JINR-E–					
1-94-154	20:2258	OSTI; NTIS (US Sales Only); INIS		DE95605353	
1-94-155	20:2259	OSTI; NTIS (US Sales Only); INIS		DE95605354	
1-94-156	20:2260	OSTI; NTIS (US Sales Only); INIS		DE95605355	
11-94-140	20:2543	OSTI; NTIS (US Sales Only); INIS		DE95605218	
11-94-204	20:2544	OSTI; NTIS (US Sales Only); INIS		DE95605219	
18-94-112	20:1888	OSTI; NTIS (US Sales Only); INIS		DE95603780	
2-94-117	20:2097	OSTI; NTIS (US Sales Only); INIS		DE95605314	
2-94-126	20:2231	OSTI; NTIS (US Sales Only); INIS		DE95605341	
2-94-127	20:2232	OSTI; NTIS (US Sales Only); INIS		DE95605342	
2-94-132	20:2056	OSTI; NTIS (US Sales Only); INIS		DE95605286	
2-94-138	20:1975	OSTI; NTIS (US Sales Only); INIS		DE95605250	
2-94-153	20:1976	OSTI; NTIS (US Sales Only); INIS		DE95605251	
2-94-162	20:2098	OSTI; NTIS (US Sales Only); INIS		DE95605315	
2-94-170	20:2057	OSTI; NTIS (US Sales Only); INIS		DE95605306	
2-94-174	20:1999	OSTI; NTIS (US Sales Only); INIS		DE95605252	
2-94-230	20:2000	OSTI; NTIS (US Sales Only); INIS		DE95605253	
2-94-88	20:2095	OSTI; NTIS (US Sales Only); INIS		DE95605322	
2-94-89	20:2096	OSTI; NTIS (US Sales Only); INIS		DE95605323	
4-94-141	20:2289	OSTI; NTIS (US Sales Only); INIS		DE95605393	
4-94-157	20:2261	OSTI; NTIS (US Sales Only); INIS		DE95605344	
5-94-172	20:2058	OSTI; NTIS (US Sales Only); INIS		DE95605279	
7-94-136	20:2262	OSTI; NTIS (US Sales Only); INIS		DE95605357	
JINR-R–					
1-94-98	20:2263	OSTI; NTIS (US Sales Only); INIS		DE95605347	
10-94-105	20:2545	OSTI; NTIS (US Sales Only); INIS		DE95605222	
10-94-149	20:1641	OSTI; NTIS (US Sales Only); INIS		DE95603985	
13-94-114	20:1642	OSTI; NTIS (US Sales Only); INIS		DE95604003	
4-94-115	20:2059	OSTI; NTIS (US Sales Only); INIS		DE95605280	
4-94-129	20:2264	OSTI; NTIS (US Sales Only); INIS		DE95605345	
4-94-137	20:2220	OSTI; NTIS (US Sales Only); INIS		DE95607311	
4-94-143	20:2290	OSTI; NTIS (US Sales Only); INIS		DE95607537	
4-94-146	20:2291	OSTI; NTIS (US Sales Only); INIS		DE95607538	
6-94-104	20:1889	OSTI; NTIS (US Sales Only); INIS		DE95603766	
7-94-134	20:2265	OSTI; NTIS (US Sales Only); INIS		DE95605358	
9-94-133	20:1555	OSTI; NTIS (US Sales Only); INIS		DE95603842	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
Juel–					
2751	20:1281	OSTI; NTIS (US Sales Only); INIS		DE95711839	
2837	20:1760	OSTI; NTIS (US Sales Only)		DE95711699	
2852	20:1643	OSTI; NTIS (US Sales Only); INIS		DE95711694	
2872	20:2440	OSTI; NTIS (US Sales Only); INIS		DE95715502	
2877	20:2168	OSTI; NTIS (US Sales Only); INIS		DE95711672	
2890	20:1236	OSTI; NTIS (US Sales Only)		DE95716124	
2892	20:1644	OSTI; NTIS (US Sales Only); INIS		DE95711497	
2901	20:1645	OSTI; NTIS (US Sales Only); INIS		DE95707754	
2907	20:1147	OSTI; NTIS (US Sales Only); INIS		DE95715733	
2909	20:104	OSTI; NTIS (US Sales Only)		DE95711383	
2914	20:1148	OSTI; NTIS (US Sales Only)		DE95711313	
2922	20:1646	OSTI; NTIS (US Sales Only); INIS		DE95711199	
K/HWP–					
26	20:1821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018746	
KCL–					
93/7	20:2068	*See* UM-P–93/38			
KCP–					
613-5388	20:1500	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001497	MF-706
613-5425	20:556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001498	MF-706
613-5432	20:1501	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001876	MF-706
613-5435	20:1149	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001496	MF-706
613-5496	20:1046	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018587	MF-700
KFK–					
4729	20:1150	OSTI; NTIS (US Sales Only); INIS		DE95715571	
5106	20:1151	OSTI; NTIS (US Sales Only); INIS		DE95715572	
5169	20:53	OSTI; NTIS (US Sales Only)		DE95708620	
5316	20:733	OSTI; NTIS (US Sales Only)		DE95711378	
5342	20:1761	OSTI; NTIS (US Sales Only); INIS		DE95716089	
5361	20:1152	OSTI; NTIS (US Sales Only); INIS		DE95715501	
5362	20:809	OSTI; NTIS (US Sales Only); INIS		DE95711312	
5369	20:1153	OSTI; NTIS (US Sales Only); INIS		DE95715587	
KFK-PEF–					
123	20:1762	OSTI; NTIS (US Sales Only)		DE95707509	
KTH-ALP-R–					
94-2.	20:2424	*See* TRITA-ALP–94-2			
94-3.	20:2425	*See* TRITA-ALP–94-3			
94-4.	20:2426	*See* TRITA-ALP–94-4			
KTM/E-B–					
181	20:285	OSTI; NTIS; INIS		DE95606761	
KTM/E-C–					
41	20:2515	OSTI; NTIS; INIS		DE95606992	
LA–					
12636	20:1763	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002140	MF-1414
12639-MS	20:2266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002247	MF-413
12792-PR	20:286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001433	MF-707
12816-PR	20:557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003018	MF-700
12835-C	20:1521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001755	MF-414
12836-MS	20:1154	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002252	MF-704; MF-706
12846-MS	20:502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001874	MF-902
12848-MS	20:1487	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002456	
12855-MS	20:2546	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002452	
12856-MS	20:2547	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002453	
12865	20:1665	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002454	MF-2000
12873-PR	20:612	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002455	MF-500
LA-SUB–					
94-131	20:2221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001744	MF-700
94-132	20:1502	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001745	MF-706
94-137	20:1440	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001746	
94-139	20:459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001749	MF-2040
94-140	20:1764	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001748	MF-402
94-141	20:1678	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001401	
94-142	20:2267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001747	MF-700
94-143	20:788	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001392	
94-148	20:1679	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001742	
94-149	20:1586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001754	
94-153	20:1097	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001753	MF-700

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-159	20:287	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001752	MF-801
94-163	20:1866	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001743	MF-408
LA-UR–					
94-1938	20:1002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014443	MF-743
94-2082	20:558	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015787	MF-700
94-2701	20:791	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018087	
94-2736	20:1330	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018264	MF-410
94-2739	20:1972	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018261	MF-703
94-2845	20:1155	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018293	MF-704
94-2871	20:122	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018299	MF-703
94-2891	20:288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018318	MF-814; MF-802; MF-810
94-3057	20:1503	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000854	MF-701
94-3124	20:1971	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000863	MF-700
94-3132	20:1765	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000862	MF-700
94-3138	20:1867	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000860	MF-708
94-3139	20:1868	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000859	MF-708
94-3160	20:1869	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001021	
94-3165	20:2441	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000923	MF-712
94-3167	20:1649	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000921	MF-706
94-3170	20:1693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000920	MF-731
94-3171	20:1694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000919	MF-731
94-3181	20:1441	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000916	MF-700
94-3184	20:2516	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000915	MF-700
94-3196	20:289	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000911	MF-2040
94-3210	20:1967	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000933	MF-408
94-3213	20:1587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000934	MF-700
94-3221	20:2442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000935	MF-712
94-3244	20:1650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000939	MF-700
94-3284	20:1156	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000847	MF-704
94-3316	20:1687	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001011	MF-741
94-3329	20:2001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001015	MF-414
94-3331	20:1331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001016	MF-732
94-3344	20:1651	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001017	MF-706
94-3351	20:1539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001018	MF-706
94-3359	20:290	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001020	MF-2030
94-3362	20:1588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001019	
94-3373	20:503	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002723	MF-702
94-3388	20:1589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002722	MF-706
94-3399	20:1766	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002700	MF-602
94-3449	20:1475	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002708	MF-705
94-3462	20:1522	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002707	MF-700
94-3491	20:291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002720	MF-741
94-3499	20:1157	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002721	MF-704
94-3533	20:2295	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002737	MF-410
94-3537	20:1237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002738	MF-404; MF-414
94-3568	20:1238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002745	MF-1390
94-3595	20:1856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002746	MF-802
94-3611	20:1476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002727	MF-410
94-3656	20:1158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002751	MF-904
94-3665	20:2443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002755	MF-422
94-3666	20:2417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002812	MF-423
94-3667	20:2444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002756	MF-424
94-3674	20:1767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002813	MF-700
LAL–					
93-10	20:2196	OSTI; NTIS (US Sales Only); INIS		DE95607193	
93-38	20:2176	OSTI; NTIS (US Sales Only); INIS		DE95607157	
LAL-RT–					
94-01	20:2548	OSTI; NTIS (US Sales Only); INIS		DE95606981	
94-02	20:2549	OSTI; NTIS (US Sales Only); INIS		DE95606982	
94-03	20:2550	OSTI; NTIS (US Sales Only); INIS		DE95606983	
LAPP–					
440-93	20:2060	OSTI; NTIS (US Sales Only); INIS		DE95607115	
LAPP-A–					
424-93	20:2061	OSTI; NTIS (US Sales Only); INIS		DE95607091	
427-93	20:2062	OSTI; NTIS (US Sales Only); INIS		DE95607120	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
450/93	20:2197	OSTI; NTIS (US Sales Only); INIS		DE95607202	
459/94	20:2063	OSTI; NTIS (US Sales Only); INIS		DE95607113	
LAPP-EXP–					
93-04	20:1583	OSTI; NTIS (US Sales Only); INIS		DE95606428	
93-05	20:1584	OSTI; NTIS (US Sales Only); INIS		DE95606429	
93-10	20:1585	OSTI; NTIS (US Sales Only); INIS		DE95606430	
94-01	20:1282	OSTI; NTIS (US Sales Only); INIS		DE95605936	
94-03	20:2177	OSTI; NTIS (US Sales Only); INIS		DE95607189	
94-04	20:1647	OSTI; NTIS (US Sales Only); INIS		DE95606708	
94-05	20:1648	OSTI; NTIS (US Sales Only); INIS		DE95606709	
LAPP-L–					
448/93	20:2064	OSTI; NTIS (US Sales Only); INIS		DE95607114	
LBL–					
27170(1994)	20:921	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018546	MF-600
34046	20:990	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018541	MF-1330
34123	20:1020	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002647	MF-1600
34243	20:991	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018543	MF-1600
34458	20:1021	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018194	MF-1600
34716	20:1022	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018196	MF-1600
35056	20:1822	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018535	MF-1600
35240	20:1023	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002648	MF-1600
35241	20:1024	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002649	MF-1600
35244	20:1025	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002650	MF-1600
35320	20:992	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018534	MF-1600
35358	20:1283	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002355	MF-404
35433	20:1284	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002352	MF-404
35535	20:1604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002349	MF-410
35566	20:896	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002651	MF-1501
35567	20:897	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002652	MF-1501
35628	20:898	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002333	MF-1500
35769	20:1365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002655	PC-401
35795	20:1613	*See* SLAC-PUB–6552			
35797	20:1610	*See* SLAC-PUB–6539			
35802	20:1890	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002342	MF-414
35843	20:1605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002356	MF-410
35844	20:1590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002335	MF-410
35865	20:1591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002350	MF-410
35911	20:1609	*See* SLAC-PUB–6533			
35913	20:1612	*See* SLAC-PUB–6548			
35919	20:1032	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018545	MF-900
35920	20:1614	*See* SLAC-PUB–6553			
35929	20:2025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002329	MF-413
35940	20:2306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002338	MF-404
35966	20:1523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002339	MF-414
36033	20:2178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002341	MF-414
36063	20:2397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002337	MF-404
36064	20:1606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002330	MF-413
36065	20:1366	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002346	MF-401
36067	20:2445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002357	MF-419
36087	20:2268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002331	MF-413
36103	20:2269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002348	MF-414
36104	20:2270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002332	MF-414
36105	20:2271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002347	MF-414
36110	20:1524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002334	MF-414
36120	20:2007	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002354	MF-413
36134	20:1026	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002328	MF-1600
36197	20:2296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002327	MF-411

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
36312	20:1495	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002654	MF-400
LBL-PUB–					
3123	20:1607	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002353	MF-400
5399	20:2272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002340	MF-414
LIU-TEK-LIC–					
1994-18	20:1652	OSTI; NTIS; INIS		DE95606688	
LPN–					
93-12.	20:2164	*See* IPNO-TH–93-47			
LRP–					
497/94	20:2418	OSTI; NTIS; INIS		DE95607649	
LSGN–					
188	20:1591	*See* LBL–35865			
189	20:1605	*See* LBL–35843			
190	20:1590	*See* LBL–35844			
191	20:1604	*See* LBL–35535			
LUMEDW-MFMR–					
1005-1-29.	20:1891	*See* LUNFD6-NFRF–1005-1-29			
LUNFD6-NFRF–					
1005-1-29	20:1891	OSTI; NTIS; INIS		DE95601924	
LYCEN–					
9419	20:2065	OSTI; NTIS (US Sales Only); INIS		DE95607092	
9420	20:2002	OSTI; NTIS (US Sales Only); INIS		DE95607018	
9423	20:2198	OSTI; NTIS (US Sales Only); INIS		DE95607200	
9424	20:1653	OSTI; NTIS (US Sales Only); INIS		DE95606710	
9426	20:2385	OSTI; NTIS (US Sales Only); INIS		DE95607807	
LYCEN-T–					
9219	20:2273	OSTI; NTIS (US Sales Only); INIS		DE95607433	
9235	20:2222	OSTI; NTIS (US Sales Only); INIS		DE95607222	
MPI-PhE–					
94-07	20:2179	OSTI; NTIS (US Sales Only); INIS		DE95716210	
94-16	20:2180	OSTI; NTIS (US Sales Only); INIS		DE95715048	
94-21	20:1654	OSTI; NTIS (US Sales Only); INIS		DE95715015	
MPI-Phe–					
94-20	20:2147	*See* DESY–94-137			
NDP–					
045	20:1857	*See* ORNL/CDIAC–55			
NEDO-C–					
9316	20:1047	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714835	
NEDO-NP–					
9318	20:1060	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714821	
9319	20:1048	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714819	
9320	20:894	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714820	
NEDO-P–					
9301	20:1089	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714808	
9302	20:1090	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714810	
9303	20:1091	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714813	
9304	20:1092	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714815	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
9305	20:1093	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714816	
9309	20:50	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714829	
9313	20:998	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714817	
9314	20:1094	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714806	
9316	20:715	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714832	
9323	20:1003	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714804	
9324	20:1159	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714802	
9328	20:929	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714801	
9332	20:993	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714823	
9358	20:1000	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714818	
9451	20:1027	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714834	
9453	20:904	OSTI; NTIS; Available from New Energy and Industrial Technology Development Organization, Sunshine 60, 30F 1-1, 3-chome, Higashi-Ikebukuro, Toshima-ku, Tokyo, Japan		DE95714833	
NEI-DK–					
1644	20:697	OSTI; NTIS		DE95707349	
1646	20:1768	OSTI; NTIS		DE95707286	
1648	20:699	OSTI; NTIS		DE95707289	
1649	20:624	OSTI; NTIS		DE95707290	
1650	20:1095	OSTI; NTIS		DE95707291	
1651	20:1028	OSTI; NTIS		DE95707293	
1661	20:628	OSTI; NTIS		DE95707337	
1662	20:635	OSTI; NTIS		DE95707335	
1664	20:92	OSTI; NTIS		DE95707342	
1666	20:723	OSTI; NTIS		DE95707366	
1668	20:700	OSTI; NTIS		DE95707361	
1669	20:979	OSTI; NTIS		DE95707338	
1671	20:625	OSTI; NTIS		DE95707364	
1674	20:1049	OSTI; NTIS		DE95707367	
1675	20:1061	OSTI; NTIS		DE95707365	
NEI-NO–					
430	20:1769	OSTI; NTIS; INIS		DE95606036	
431	20:1924	OSTI; NTIS; INIS		DE95606194	
NGU–					
93-152	20:1823	OSTI; NTIS; INIS		DE95605965	
NREL/CP–					
433-7265	20:629	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011891	MF-1312

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
NREL/CP–					
442-6877	20:724	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000222	MF-1210
NREL/SP–					
463-6156	20:642	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000286	MF-1300
NREL/TP–					
411-7170	20:684	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011899	MF-1280
411-7190	20:685	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000215	MF-1262
411-7350	20:686	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000245	MF-1280
442-7227	20:1001	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000247	MF-1210
451-6638	20:687	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011838	MF-1250
451-7162	20:688	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011886	MF-1263
451-7166	20:689	OSTI; NTIS; GPO Dep.	E 1.99:	DE94000210	MF-1264
451-7189	20:690	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000244	MF-1263
473-7260	20:1083	OSTI; NTIS; GPO Dep.	E 1.99:	DE94011859	MF-1501
NRFEM(EC)–					
740	20:460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002194	MF-502
NRL/MR–					
6770-94-7609	20:2446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001437	MF-712
NRRI–					
94-13	20:138	OSTI; The National Regulatory Research Institute, The Ohio State University, 1080 Carmack Road, Columbus, OH 43210.		TI94018691	
NUREG–					
0750-Vol.39-Index-2	20:794	OSTI; NTIS; INIS; GPO		TI95001878	
0750-Vol.40-No.2	20:750	OSTI; NTIS; INIS; GPO		TI95002162	
1484-Vol.1	20:149	OSTI; NTIS; INIS; GPO		TI94017960	
1484-Vol.2	20:150	OSTI; NTIS; INIS; GPO		TI94017961	
1494	20:292	OSTI; NTIS; INIS; GPO		TI95001502	
NUREG/CP–					
0138	20:874	OSTI; NTIS; INIS; GPO		TI95002937	
NUREG/CR–					
4674-Vol.19	20:875	OSTI; NTIS; INIS; GPO		TI95002938	
4674-Vol.20	20:876	OSTI; NTIS; INIS; GPO		TI95002939	
5403	20:1442	OSTI; NTIS; INIS; GPO		TI95002934	
5535-Vol.6	20:877	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020; INIS; GPO		TI95002270	
5591-Vol.2-No.2	20:1160	OSTI; NTIS; INIS		TI95001892	
6087	20:878	OSTI; NTIS; INIS; GPO		TI95002269	
6105	20:830	OSTI; NTIS; INIS; GPO		TI95001460	
6146	20:831	OSTI; NTIS; GPO; INIS		TI95001364	
6161	20:879	OSTI; NTIS; INIS; GPO		TI95002268	
6166	20:880	OSTI; NTIS; INIS; GPO		TI95001503	
6203	20:1824	OSTI; NTIS; INIS; GPO		TI94017979	
6228	20:810	OSTI; NTIS; INIS; GPO		TI95001501	
6249	20:1161	OSTI; NTIS; INIS; GPO		TI95003010	
6267	20:881	OSTI; NTIS; INIS; GPO		TI95003013	
6281	20:811	OSTI; NTIS; INIS; GPO		TI95003004	
OAEP–					
1-129	20:1332	OSTI; NTIS (US Sales Only); INIS		DE95603148	
OCDO–					
94012360	20:51	OSTI; Ohio Coal Development Office, 77 S. High St., P.O. Box 1001, Columbus, OH 43266-0001		TI94012360	
ORNL–					
6623/Suppl.	20:1825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002949	MF-511
6804	20:885	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002372	MF-1370
6807	20:504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001825	MF-511
6808	20:505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002491	MF-511
6829	20:1367	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002058	MF-401

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
ORNL/CDIAC–					
55	20:1857	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001873	MF-402
70	20:1968	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003060	MF-402
ORNL/CON–					
362	20:1029	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001652	MF-1600
398	20:994	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001500	MF-1320
ORNL/ER–					
201	20:465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002305	MF-2010
213/R1	20:506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002294	MF-2010
224-D2	20:1790	*See* DOE/OR–01-1288-D2			
235	20:507	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002308	MF-2010
253	20:246	*See* DOE/OR–01-1314-D1			
26	20:461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002290	MF-2010
270-D1	20:243	*See* DOE/OR–01-1311-D1			
273-D1	20:244	*See* DOE/OR–01-1312-D1			
274-D1	20:245	*See* DOE/OR–01-1313-D1			
69	20:462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002291	MF-2010
72	20:463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002307	MF-2010
74	20:464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002292	MF-2010
ORNL/ER/Sub–					
87-99053/73	20:508	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94019249	MF-902
ORNL/M–					
3789	20:863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002303	MF-400
ORNL/NOAC–					
232-Vol.19	20:875	*See* NUREG/CR–4674-Vol.19			
232-Vol.20	20:876	*See* NUREG/CR–4674-Vol.20			
ORNL/TM–					
11568-Vol.2-No.2	20:1160	*See* NUREG/CR–5591-Vol.2-No.2			
12441	20:293	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002490	MF-510
12671	20:930	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001771	MF-400
12692	20:1030	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003059	MF-1600
12701	20:882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001863	MF-507
12712	20:607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002306	MF-406; MF-411
12735	20:810	*See* NUREG/CR–6228			
12741	20:1826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001871	
12753	20:2551	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001651	MF-405
12754	20:2552	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001826	MF-405
12774	20:1827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002507	MF-2000
12777	20:1161	*See* NUREG/CR–6249			
12792	20:294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002512	MF-2020
12807	20:2553	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001770	MF-405
12819	20:2554	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001739	MF-405
12825	20:295	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002841	MF-2020
12826	20:1488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002489	MF-404
OUP–					
94-12	20:2223	OSTI; NTIS; INIS		DE95607223	
94-13	20:2274	OSTI; NTIS; INIS		DE95607418	
94-14	20:2517	OSTI; NTIS; INIS		DE95606993	
94-15	20:1655	OSTI; NTIS; INIS		DE95606711	
OZ–					
93/01.	20:2066	*See* UM-P–93/01			
93/11.	20:2183	*See* UM-P–93/51			
93/12.	20:2099	*See* UM-P–93/54			
93/13.	20:2184	*See* UM-P–93/58			
93/15.	20:2073	*See* UM-P–93/71			
PATENTS-US–					
A7946733	20:296	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001780	MF-704

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
A7950548	20:2555	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001779	MF-405; MF-406
A7950552	20:1419	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001778	MF-701
A7952247	20:1080	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001776	MF-406
A7952439	20:1081	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001775	MF-406
A7952931	20:615	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001774	MF-700
A7953042	20:1672	OSTI; NTIS (US Sales Only); GPO Dep.	E 1.99:	DE95001773	MF-706
PFC/RR–					
93-7	20:2431	*See* DOE/ER/54186–T2			
94-2	20:1110	*See* DOE/ER/54186–T3			
94-5	20:2432	*See* DOE/ER/54186–T4			
94-6	20:2433	*See* DOE/ER/54186–T5			
PNL–					
10056	20:1829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003095	MF-602
10061	20:298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002582	MF-2000
10082	20:466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002318	MF-2010
10093	20:1858	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001312	MF-600
10094	20:1830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000978	MF-2010
10099	20:299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001660	MF-2070
10101	20:300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001659	MF-2070
10107	20:301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002853	MF-2030
10114	20:931	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001853	MF-1400
10123	20:510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003174	MF-2010
10125	20:1031	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001789	MF-1600
10127	20:302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001661	MF-2030
10128	20:303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001658	MF-2030
10132	20:548	*See* DOE/RL–94-113			
10133	20:511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001854	MF-2000
10146	20:304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002845	MF-2000
10147	20:305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001484	MF-2010
10150	20:306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001923	MF-2070
10158	20:307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001922	MF-2010
10172	20:308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002583	MF-2030
10182	20:1831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001855	MF-2010
10188	20:932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002842	MF-408
10189	20:512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003175	MF-2030
10192	20:549	*See* DOE/RL–94-124			
10197	20:970	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002586	MF-700
10198	20:309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003176	MF-2030
6415-Rev.6	20:579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018726	MF-2000
8900	20:297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003006	MF-510
9000-Pt.4	20:1941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001483	MF-408
9424	20:509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001462	MF-2010
9963	20:1828	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002834	MF-902
9990	20:1969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001924	MF-2010
PNL-SA–					
23112	20:1333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017799	MF-2030

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
23466	20:1334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017795	MF-2020
23687	20:933	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001431	MF-2000
23850	20:310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017460	MF-2030
24404	20:922	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017456	MF-2000
6989	20:838	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001329	MF-502
7574	20:639	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001330	MF-500
POEF-SH–					
19	20:151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001510	MF-500
POEF-T–					
3636	20:1443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001509	MF-505
PPPL–					
2975	20:2419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001928	PC-420
3010	20:2420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001929	PC-420; PC-426
3016	20:2421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001930	PC-421; PC-426
PPPL-CFP–					
3140	20:1368	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018446	MF-402
3163	20:2422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002219	MF-421
3167	20:2423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002221	MF-420
PSI–					
94-11	20:1832	OSTI; NTIS; INIS		DE95605966	
94-14	20:1335	OSTI; NTIS; INIS		DE95605571	
94-15	20:1833	OSTI; NTIS; INIS		DE95605967	
94-20	20:1087	OSTI; NTIS		DE95713895	
PTB-Dos–					
23	20:1942	OSTI; NTIS (US Sales Only); INIS		DE95715283	
PU-NE–					
93/1	20:881	*See* NUREG/CR–6267			
RAG–					
00430100	20:77	*See* ETDE/DE-mf–95716317			
07760000	20:129	*See* ETDE/DE-mf–95716315			
RERF-R–					
1-93	20:1943	OSTI; NTIS; INIS		DE95709883	
RFP–					
4834	20:311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017987	MF-721
4873	20:312	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001875	MF-701
4883	20:559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001690	MF-721
4890	20:313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001971	MF-721
RFP-ADD–					
0030	20:911	OSTI; NTIS; GPO Dep.	E 1.99:	DE94010792	MF-700
RISO-R–					
754(EN)	20:2386	OSTI; NTIS; INIS		DE95607808	
767(DA)	20:995	OSTI; NTIS; Also available from Risoe Library, P.O. Box 49, DK-4000 Roskilde, Denmark		DE95707368	
SAND–					
90-7083	20:1680	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002317	MF-706
93-0737	20:208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018516	MF-722
93-1531	20:1504	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002952	MF-700
93-3909C	20:1444	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000744	MF-706
93-3998	20:880	*See* NUREG/CR–6166			
93-4018C	20:1681	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002185	MF-706
93-4074C	20:1682	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001608	
93-7054/1	20:1695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002953	MF-700
94-0024	20:1666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002954	MF-702
94-0146	20:812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001508	
94-0278	20:314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001856	MF-814
94-0294	20:1285	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002955	
94-0378C	20:1698	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001628	MF-700
94-0551	20:712	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002956	MF-1242
94-0805C	20:315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001605	MF-2010
94-1016C	20:1683	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002182	MF-706; MF-702
94-1071C	20:1673	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001620	MF-704
94-1173	20:1477	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002587	MF-705

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-1181C	20:1445	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018896	
94-1237	20:513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001794	MF-510
94-1245C	20:706	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001831	MF-1302
94-1280C	20:1286	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001827	MF-704
94-1302C	20:1505	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018901	MF-706
94-1318C	20:1287	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001525	MF-704
94-1375C	20:1667	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001830	MF-706
94-1398C	20:899	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001603	MF-1350
94-1498	20:2026	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001416	MF-705
94-1508	20:934	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018747	MF-700
94-1539C	20:1162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001834	MF-520
94-1606C	20:1699	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001881	
94-1607	20:1288	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002588	MF-706
94-1664	20:1446	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002589	MF-706
94-1670C	20:2307	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001522	MF-700
94-1710	20:1050	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001417	MF-700
94-1716	20:1163	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002957	MF-701
94-1743	20:123	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001795	MF-126
94-1745C	20:105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001627	MF-814
94-1758C	20:707	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001622	MF-1302
94-1817C	20:1696	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001621	MF-700
94-1819	20:1447	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001857	MF-705
94-1826	20:2556	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001919	MF-706
94-1859C	20:1525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001612	MF-700
94-1881C	20:560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94015785	MF-706
94-1910C	20:558	*See* LA-UR–94-2082			
94-1911C	20:1592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002611	MF-712
94-1940C	20:52	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001625	MF-108
94-1978C	20:1506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002181	MF-706
94-2033C	20:792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001604	
94-2047	20:900	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002958	MF-1350
94-2068	20:691	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002316	MF-1290
94-2106	20:316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002590	MF-721
94-2137	20:935	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002959	MF-700
94-2143	20:1697	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001796	MF-706
94-2144C	20:1684	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017403	MF-706
94-2156C	20:1668	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017418	MF-706
94-2201C	20:1507	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000738	MF-704
94-2339C	20:467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001882	MF-814
94-2349C	20:2557	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001607	MF-706
94-2354C	20:1448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001617	MF-706
94-2361	20:1685	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001858	MF-706
94-2376C	20:793	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001606	
94-2380C	20:317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001618	MF-2030
94-2400C	20:883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001829	MF-520
94-2431C	20:708	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001623	MF-1302
94-2432C	20:701	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001624	MF-1300
94-2437C	20:702	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001828	MF-1302
94-2453	20:692	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002314	MF-1272
94-2469C	20:1508	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000536	MF-706
94-2472C	20:1674	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000540	MF-1350
94-2498C	20:694	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001626	MF-1250
94-2542C	20:1509	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000745	MF-706
94-2548C	20:2558	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001602	MF-900
94-2570C	20:561	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001523	MF-700
94-2572	20:1669	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001859	MF-706
94-2581C	20:936	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001526	MF-700
94-2625C	20:1033	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001880	MF-706
94-2676C	20:1164	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002183	MF-706; MF-704

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
94-2703C	20:514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002189	MF-2050
94-2759C	20:318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002187	MF-2000
94-8239	20:1688	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002492	MF-704
94-8244	20:1424	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002591	MF-401
94-8245	20:1449	OSTI; NTIS; GPO Dep.	E 1.99:	DE94017684	MF-706
94-8409	20:1425	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002592	MF-741
94-8709C	20:1689	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002486	MF-701
94-8718C	20:2559	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001506	MF-706
94-8724C	20:884	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003033	MF-706
94-8730C	20:1426	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002481	MF-401
95-8424C	20:2341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002487	MF-411
SCL-DR–					
720025	20:1686	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001571	MF-705
720077	20:1034	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001572	MF-706
SCPRI-RM–					
4-1994	20:1834	OSTI; NTIS (US Sales Only); INIS		DE95605970	
5-1994	20:1835	OSTI; NTIS (US Sales Only); INIS		DE95605971	
SKB-TR–					
93-24	20:1836	OSTI; NTIS; INIS		DE95606011	
94-05	20:1837	OSTI; NTIS; INIS		DE95606012	
94-06	20:319	OSTI; NTIS; INIS		DE95606789	
94-07	20:1838	OSTI; NTIS; INIS		DE95606013	
SLAC-PUB–					
6449	20:1526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002777	MF-414
6517	20:1608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002868	MF-414
6533	20:1609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002874	MF-404
6535	20:1593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001489	MF-414
6539	20:1610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002876	MF-414
6540	20:1611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002877	MF-414
6548	20:1612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002881	MF-414
6552	20:1613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002882	MF-414
6553	20:1614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002883	MF-414
6586	20:2181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001848	MF-414
6595	20:2199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002121	MF-414
6665	20:2182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002783	MF-414
6677	20:1594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001849	MF-414
6686	20:1656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001850	MF-414
6690	20:1595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001707	MF-414
SLAC/SSRL–					
0068	20:1526	*See* SLAC-PUB–6449			
0077	20:1608	*See* SLAC-PUB–6517			
SPE–					
28384	20:122	*See* LA-UR–94-2871			
SR/H–					
751	20:864	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015373	MF-700
755	20:865	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015701	MF-700
756	20:866	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015702	MF-700
758	20:867	OSTI; NTIS; GPO Dep.	E 1.99:	DE94015704	MF-700
781	20:742	*See* DPW–56-394			
785	20:1434	*See* DPW–56-371			
825	20:872	*See* DPW–53-1402-Del.Ver.			
826	20:154	*See* DPW–54-21-1-Del.Ver.			
827	20:152	*See* DPW–53-1307-Del.Ver.			
828	20:843	*See* DPW–54-200-Del.Ver.			
829	20:815	*See* DPW–53-1247-Del.Ver.			
832	20:841	*See* DPW–53-1146-Del.Ver.			
834	20:825	*See* DPW–53-1362-Del.Ver.			
842	20:868	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002376	MF-700
847	20:854	*See* DPW–55-17-21			
848	20:855	*See* DPW–55-17-22			
849	20:254	*See* DPW–55-15-12			
850	20:844	*See* DPW–55-15-5			
852	20:845	*See* DPW–55-16-41			
854	20:836	*See* DPW–53-1322			
855	20:842	*See* DPW–53-1311			
864	20:168	*See* DPW–55-4-13			
865	20:169	*See* DPW–55-4-14			
868	20:170	*See* DPW–55-4-17			
873	20:167	*See* DPW–55-4-12			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
874	20:179	*See* DPW–55-4-38			
875	20:180	*See* DPW–55-4-39			
876	20:153	*See* DPW–53-1343-Del.Ver.			
877	20:171	*See* DPW–55-4-18			
878	20:172	*See* DPW–55-4-19			
879	20:173	*See* DPW–55-4-21			
886	20:177	*See* DPW–55-4-34			
887	20:175	*See* DPW–55-4-32			
889	20:174	*See* DPW–55-4-29			
890	20:178	*See* DPW–55-4-36			
892	20:181	*See* DPW–55-4-41			
893	20:182	*See* DPW–55-4-42			
895	20:183	*See* DPW–55-4-43			
895	20:184	*See* DPW–55-4-44			
897	20:156	*See* DPW–55-17-17			
898	20:853	*See* DPW–55-17-18			
899	20:157	*See* DPW–55-17-19			
900	20:165	*See* DPW–55-4-6			
901	20:166	*See* DPW–55-4-7			
902	20:849	*See* DPW–55-17-11			
903	20:850	*See* DPW–55-17-12			
905	20:852	*See* DPW–55-17-14			
906	20:155	*See* DPW–55-17-15			
909	20:847	*See* DPW–55-17-9			
910	20:848	*See* DPW–55-17-10			
911	20:846	*See* DPW–55-17-4			
SSCL–					
649	20:1596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002105	MF-414
676	20:1597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002103	MF-414
678	20:1540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002100	MF-414
679	20:1598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002101	MF-414
688	20:1599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002102	MF-414
689	20:1600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002099	MF-400
SSI–					
94-03	20:1944	OSTI; NTIS; INIS		DE95606197	
94-04	20:1945	OSTI; NTIS; INIS		DE95606198	
94-05	20:1946	OSTI; NTIS; INIS		DE95606199	
STUDSVIK-ES–					
94-26	20:1859	OSTI; NTIS; INIS		DE95606021	
STUK-B-YTO–					
120	20:751	OSTI; NTIS; INIS		DE95606520	
STUK-YTO-TR–					
36	20:752	OSTI; NTIS; INIS		DE95606521	
45	20:753	OSTI; NTIS; INIS		DE95606522	
51	20:1450	OSTI; NTIS; INIS		DE95606397	
53	20:747	OSTI; NTIS; INIS		DE95606516	
58	20:754	OSTI; NTIS; INIS		DE95606523	
59	20:766	OSTI; NTIS; INIS		DE95606555	
69	20:767	OSTI; NTIS; INIS		DE95606556	
SUBJ/CAT–					
1993/ENV.	20:2513	*See* INIS-mf–14358			
1993/NPCW.	20:2514	*See* INIS-mf–14359			
1993/NRS.	20:1918	*See* INIS-mf–14360			
TAUP–					
2183-94.	20:2160	*See* IC–94/203			
TEU–					
0134/90	20:1067	*See* ETDE/DE-mf–95716359			
TIFR/TH–					
94-24	20:2043	*See* IC–94/147			
TPJU–					
12/94.	20:2198	*See* LYCEN–9423			
TRITA-ALP–					
94-2	20:2424	OSTI; NTIS; INIS		DE95607603	
94-3	20:2425	OSTI; NTIS; INIS		DE95607590	
94-4	20:2426	OSTI; NTIS; INIS		DE95607591	
TVA-Circ.–					
Z-335	20:1844	*See* CONF-9308250–1			
TVA/NFERC–					
93/4	20:1051	OSTI; NTIS		DE95001587	
93/6	20:1052	OSTI; NTIS		DE95001585	
93/7	20:1870	OSTI; NTIS		DE95001586	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93/8	20:626	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001719	MF-1310
94/1	20:1369	OSTI; NTIS		DE95001584	
UBA-FB–					
94-104	20:1745	*See* GKSS–94/E/8			
UCRL-CR–					
117756	20:1973	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002472	MF-702; MF-705
118446	20:1700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002399	MF-708
UCRL-ID–					
106454-94-3	20:562	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001464	MF-700
113867-94	20:515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002593	MF-702
116220	20:516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000512	MF-2030
116263	20:2427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002960	MF-420
117293	20:1099	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002595	MF-700
118059	20:1770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002596	MF-402
118245	20:1442	*See* NUREG/CR–5403			
UCRL-JC–					
115131	20:1974	OSTI; NTIS; GPO Dep.	E 1.99:	DE94016968	MF-700
115352	20:320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002404	MF-814
115758	20:141	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001505	MF-123
115809	20:1053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94014728	MF-702
115854	20:2560	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001837	MF-700
116176-Rev.1	20:1675	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001967	MF-700
116202	20:321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002266	MF-721
116231-Rev.1	20:2561	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000841	MF-905
116407	20:1336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002398	MF-701
116431	20:322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002403	MF-810
116774	20:1510	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002265	MF-712
116930	20:1511	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001504	MF-706
116963	20:2562	OSTI; NTIS; GPO Dep.	E 1.99:	DE94019312	MF-706
117078	20:1451	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018548	MF-706
117285	20:713	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002391	MF-903
117547	20:2563	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002392	MF-700
117548	20:2564	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002393	MF-700
117602	20:1004	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002396	MF-404
117613	20:2342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002394	MF-404
117820	20:1452	OSTI; NTIS; GPO Dep.	E 1.99:	DE94018327	MF-706
118154	20:2565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000552	MF-706
118161	20:2447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002264	MF-712
118407	20:2387	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002402	MF-701
118432	20:1839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002471	MF-2010
UCRL-LR–					
114070-6	20:1098	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001785	PC-700
UCSD–					
955220	20:2028	*See* DOE/ER/40546–T6			
UM-P–					
92/77	20:2360	OSTI; NTIS (US Sales Only); INIS		DE95607773	
93/01	20:2066	OSTI; NTIS (US Sales Only); INIS		DE95607093	
93/04	20:2428	OSTI; NTIS (US Sales Only); INIS		DE95607629	
93/33	20:2067	OSTI; NTIS (US Sales Only); INIS		DE95607094	
93/38	20:2068	OSTI; NTIS (US Sales Only); INIS		DE95607095	
93/42	20:2200	OSTI; NTIS (US Sales Only); INIS		DE95607194	
93/44	20:2069	OSTI; NTIS (US Sales Only); INIS		DE95607096	
93/45	20:2070	OSTI; NTIS (US Sales Only); INIS		DE95607097	
93/46	20:2003	OSTI; NTIS (US Sales Only); INIS		DE95607019	
93/49	20:1289	OSTI; NTIS (US Sales Only); INIS		DE95605947	
93/50	20:2004	OSTI; NTIS (US Sales Only); INIS		DE95607020	
93/51	20:2183	OSTI; NTIS (US Sales Only); INIS		DE95607159	
93/53	20:2005	OSTI; NTIS (US Sales Only); INIS		DE95607021	
93/54	20:2099	OSTI; NTIS (US Sales Only); INIS		DE95607129	
93/56	20:2398	OSTI; NTIS (US Sales Only); INIS		DE95607846	
93/58	20:2184	OSTI; NTIS (US Sales Only); INIS		DE95607190	
93/61	20:2006	OSTI; NTIS (US Sales Only); INIS		DE95607022	
93/63	20:2071	OSTI; NTIS (US Sales Only); INIS		DE95607099	
93/65	20:2072	OSTI; NTIS (US Sales Only); INIS		DE95607100	
93/66	20:2275	OSTI; NTIS (US Sales Only); INIS		DE95607388	
93/70	20:2027	OSTI; NTIS (US Sales Only); INIS		DE95607056	
93/71	20:2073	OSTI; NTIS (US Sales Only); INIS		DE95607101	

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
93/72	20:2074	OSTI; NTIS (US Sales Only); INIS		DE95607102	
93/73	20:2345	OSTI; NTIS (US Sales Only); INIS		DE95607769	
UR–					
1316	20:2157	*See* IC–93/216			
USGS-OFR–					
89-582	20:454	*See* DOE/OR/21865–1			
93-126	20:451	*See* DOE/ID–22110			
94-162	20:1840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003009	MF-902
94-55	20:1783	*See* DOE/ID–22112			
94-76	20:1785	*See* DOE/ID–22114			
USGS/OFR–					
94-66	20:1784	*See* DOE/ID–22113			
USGS/WRI–					
93-4201	20:1849	*See* DOE/ID–22111			
VTT-TIED–					
1538	20:1841	OSTI; NTIS; INIS		DE95606014	
VYH-JULK–					
A146	20:1842	OSTI; NTIS; INIS		DE95605972	
WAPD-RC/E(EE)–					
3300	20:468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001438	MF-502
WHC-EP–					
0460	20:323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001296	MF-2030
0467-Rev.1	20:324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002474	MF-2000
0694	20:517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001554	MF-2010
0782-Vol.1	20:518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001846	MF-2030
0782-Vol.2	20:519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001847	MF-2030
0786	20:325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002232	MF-2030
0794	20:326	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001529	MF-2030
0802	20:327	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002473	MF-2020
0804	20:869	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001988	MF-2020
0805	20:328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001843	MF-2030
0816	20:329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001578	MF-2010
0823	20:330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002971	MF-2000
WHC-MR–					
0418	20:469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001986	MF-2070
0479	20:1290	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002963	MF-2000
0480	20:331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002965	MF-2000
WHC-SA–					
1455	20:520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017416	MF-2000
1884	20:332	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001641	MF-2030
1937	20:1843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001642	MF-2070
2141	20:1453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001987	MF-2000
2235	20:521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018150	MF-2020
2302	20:333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001643	MF-2020
2489	20:1005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001295	MF-2000
2559	20:334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94017995	MF-2070
2653	20:522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001630	MF-610
2664	20:186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001640	MF-2060

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
2683	20:937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001534	MF-2080
WHC-SD-CP-PLN–					
025	20:335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001306	MF-2070
026	20:336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002081	MF-2020
WHC-SD-CP-QAPP–					
015	20:337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002082	MF-2020
WHC-SD-CP-RPT–					
014	20:563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001835	MF-520
WHC-SD-CP-TI–					
193	20:338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001635	MF-721
WHC-SD-EN-TI–					
280	20:339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018470	MF-2010
290	20:340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002156	MF-2070
WHC-SD-EN-TRP–					
007	20:1496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001463	MF-2040
WHC-SD-FF-SSP–					
052	20:870	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001565	MF-2050
WHC-SD-FL-ELS–					
001	20:886	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001563	MF-500
WHC-SD-GN-CSWD–					
30036-Rev.1	20:1454	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002141	MF-2000
WHC-SD-GN-DGS–					
30011	20:1455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001566	MF-2020
WHC-SD-GN-ISB–					
30001	20:341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001568	MF-2000
WHC-SD-GN-SA–					
30006	20:1456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002120	MF-2000
WHC-SD-GN-TRP–					
20024	20:523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003073	MF-2060
30011	20:524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001041	MF-2000
30018	20:525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001538	MF-2060
WHC-SD-HWV-SDP–					
004-Rev.1	20:342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000986	MF-2000
WHC-SD-L045H-OTR–					
001	20:343	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002364	MF-2030
WHC-SD-L045H-PC–					
001	20:1860	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001559	MF-2000
WHC-SD-L070-PMP–					
001	20:1771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001040	MF-2010
WHC-SD-LL-RD–					
004	20:996	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002460	MF-1371
WHC-SD-NR-CSER–					
013	20:344	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001840	MF-2030
WHC-SD-PRP-HA–					
010	20:345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001596	MF-2000
WHC-SD-SNF-ATP–					
001	20:2566	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002149	MF-700
002	20:564	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002150	MF-700
003	20:565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002153	MF-700

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
WHC-SD-SNF-ER–					
003	20:346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001557	MF-2070
004	20:1165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002962	MF-2000
WHC-SD-SNF-ES–					
001	20:470	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001035	MF-2010
003	20:347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001519	MF-510
WHC-SD-SNF-LB–					
001	20:471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001649	MF-2000
WHC-SD-SNF-PLN–					
001	20:348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002108	MF-2070
WHC-SD-SNF-SARR–					
002-Rev.1	20:526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002096	MF-510
WHC-SD-SNF-TC–					
001	20:349	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001597	MF-2020
WHC-SD-SNF-TP–					
005	20:566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002151	MF-700
WHC-SD-SNF-WP–					
002	20:350	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001229	MF-506
WHC-SD-SQA-CSA–					
20374	20:527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001644	MF-2000
20377	20:351	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001637	MF-2030
WHC-SD-SQA-CSWD–					
30016	20:1657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001599	MF-2010
WHC-SD-TD-ER–					
004	20:1457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001564	MF-2030
WHC-SD-TP-UM–					
002-Rev.1	20:209	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002278	MF-2000
WHC-SD-W007H-ATP–					
002	20:1658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002086	MF-2000
WHC-SD-W026-OCD–					
001	20:352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001593	MF-2020
WHC-SD-W026-TI–					
006-Rev.1	20:353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001838	MF-2020
009	20:354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002071	MF-2020
WHC-SD-W026-TP–					
001	20:355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001981	MF-2000
008	20:356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001842	MF-2020
WHC-SD-W049H-ATP–					
001	20:357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001516	MF-2010
WHC-SD-W059-ES–					
002	20:358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002088	MF-506
WHC-SD-W100-ACDR–					
001	20:359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002114	MF-721
WHC-SD-W100-SDRD–					
001	20:360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001839	MF-2020
WHC-SD-W100-SP–					
001	20:361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002112	MF-721
WHC-SD-W100-TP–					
011	20:362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001520	MF-2020
014	20:363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002109	MF-2020

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
WHC-SD-W112-ES-					
006	20:364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001600	MF-2050
WHC-SD-W236A-ER-					
011	20:365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001436	MF-2030
WHC-SD-W306-PAP-					
001	20:366	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002073	MF-721
WHC-SD-W306-TI-					
002	20:367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002362	MF-721
WHC-SD-W320-TC-					
002	20:1458	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002089	MF-2020
WHC-SD-W378-ES-					
001	20:368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001532	MF-2020
WHC-SD-WM-ANAL-					
033-Vol.2	20:369	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018728	MF-2030
034-Vol.1	20:370	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018467	MF-2030
034-Vol.2	20:371	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018468	MF-2030
WHC-SD-WM-ATP-					
023-Rev.5	20:372	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001560	MF-2030
082	20:373	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001373	MF-2030
100	20:374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002142	MF-2030
103	20:1676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001514	MF-2000
WHC-SD-WM-ATR-					
044	20:375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002237	MF-2030
098	20:376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002075	MF-2030
WHC-SD-WM-CSCM-					
027	20:377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002280	MF-2030
WHC-SD-WM-CSRS-					
016	20:378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002146	MF-2030
WHC-SD-WM-DA-					
157	20:379	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003052	MF-2030
163	20:380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018441	MF-706
WHC-SD-WM-DGS-					
001	20:381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002093	MF-2030
WHC-SD-WM-DP-					
071	20:382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002115	MF-2070
WHC-SD-WM-DQO-					
011-Rev.1	20:528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001570	MF-2070
014	20:383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001434	MF-2020
WHC-SD-WM-DTR-					
036	20:384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001375	MF-2030
WHC-SD-WM-ER-					
308	20:385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001898	MF-2070
309	20:386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001980	MF-2070
310	20:387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001983	MF-2070
311	20:388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001900	MF-2070; MF-2030

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
312	20:389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001901	MF-2070; MF-2030
313	20:390	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001982	MF-2070
323	20:391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001979	MF-2070
324	20:392	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001899	MF-2070
325	20:393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002233	MF-2070
363	20:394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001468	MF-2070
364	20:395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001407	MF-2070
380	20:1459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002370	MF-2030
382	20:396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002095	MF-2070
387	20:397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002091	MF-2070
WHC-SD-WM-ES–					
300	20:529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001511	MF-2030
313	20:530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002209	MF-2050
WHC-SD-WM-ETP–					
0106	20:398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002236	MF-2070
122	20:399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002076	MF-2030
WHC-SD-WM-EV–					
025-Rev.1	20:400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002235	MF-2000
060-Rev.4	20:401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001374	MF-2070
WHC-SD-WM-FDC–					
031	20:402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002160	MF-2030
WHC-SD-WM-LL–					
006	20:531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002279	MF-2030
WHC-SD-WM-PAP–					
60	20:403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002368	MF-2020
WHC-SD-WM-PE–					
053	20:404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001631	MF-2020
WHC-SD-WM-PLN–					
090	20:405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002369	MF-2020
WHC-SD-WM-PMP–					
014	20:406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001411	MF-2070
WHC-SD-WM-PRS–					
014	20:532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001435	MF-2050
WHC-SD-WM-QAPP–					
029	20:407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002145	MF-2030
030	20:408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002161	MF-2030
WHC-SD-WM-RD–					
038-Rev.1	20:409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001984	MF-2030
WHC-SD-WM-RPT–					
087	20:410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002239	MF-2020
093	20:472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001378	MF-2010

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
WHC-SD-WM-SAR–					
064	20:533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001836	MF-2030
WHC-SD-WM-SD–					
019	20:411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002077	MF-2030
WHC-SD-WM-SDD–					
025	20:412	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001636	MF-2020
049	20:1460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001556	MF-2030
WHC-SD-WM-TA–					
158	20:413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002078	MF-2030
WHC-SD-WM-TI–					
399-Rev.2	20:414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001404	MF-2000
607	20:415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE94018151	MF-2020
643	20:416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001408	MF-2030
645	20:417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002090	MF-2070
648	20:418	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001638	MF-2070
661	20:419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002084	MF-2070
664	20:420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001377	MF-2070
WHC-SD-WM-TP–					
207	20:421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002080	MF-2070
271	20:534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002094	MF-2070
WHC-SD-WM-TRP–					
220	20:422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002367	MF-2020
WHC-SD-WM-WP–					
072-Rev.3	20:423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002097	MF-2030
132-Rev.4	20:424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001515	MF-2030
245-Rev.1	20:425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002143	MF-2030
264	20:426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002074	MF-2000
WHC-SP–					
1009-Rev.1	20:427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001985	MF-2070
1096	20:213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001249	MF-2000
1097	20:428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001844	MF-2000
1105	20:535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002964	MF-600
1106	20:2518	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001841	MF-900
1109	20:2519	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001316	MF-2000
1110	20:214	OSTI; NTIS; GPO Dep.	E 1.99:	DE95003047	MF-2000
1119	20:536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002107	MF-2000
1122-Vol.1	20:2520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002837	MF-2000
1122-Vol.2	20:2521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002838	MF-2000
1122-Vol.3	20:2522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002839	MF-2000
1122-Vol.4	20:537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002840	MF-2000
1125	20:938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002458	MF-500
1126-Vol.1	20:538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001821	MF-2050

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
WHC-SP–					
1126-Vol.3	20:539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001823	MF-2050
1127	20:2523	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001580	MF-900
1142	20:429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002968	MF-2020
WRI–					
94-R026	20:927	*See* DOE/MC/30127–3917			
WSRC–					
3Q1-2-Vol.1-Rev.3	20:473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001246	MF-702
WSRC-IM–					
94-42	20:540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001245	MF-700
WSRC-MS–					
94-0180	20:613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001896	MF-707
94-0284	20:210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95000757	MF-721
94-0563	20:211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002692	MF-721
WSRC-RP–					
92-376	20:430	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002684	MF-700
93-67-4-Vol.1	20:541	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001143	MF-702
93-67-4-Vol.2	20:474	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001144	MF-702
93-67-4-Vol.3	20:542	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001145	MF-702
WSRC-TR–					
93-762	20:431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001476	MF-2020
94-0184-Del.Ver.	20:212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95003109	MF-721
94-0243	20:432	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002826	MF-702
94-0244	20:433	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002827	MF-702
94-0245	20:434	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002828	MF-702
94-0246	20:475	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001466	MF-702
94-0290	20:435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002829	MF-721
94-0296	20:436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001465	MF-2070
94-0297	20:437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002818	MF-721
94-0305	20:438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002819	MF-721
94-0346	20:439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002697	MF-2010
94-0347	20:440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002698	MF-2010
94-0348	20:441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002696	MF-2010
94-0351	20:476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002664	MF-702
94-0361	20:543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002820	MF-702
94-0385	20:442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002686	MF-702
94-0387	20:443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002685	MF-702
94-0425	20:477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001473	MF-703
94-0449	20:813	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001809	MF-704
94-0468	20:1772	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002682	MF-702
Y–					
2465-3-Draft	20:1337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001693	MF-700
Y/DQ–					
51	20:1947	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001695	MF-707
Y/DV–					
1353	20:819	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002053	MF-704
Y/DW–					
1332	20:1489	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002060	MF-706
1341	20:1461	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002057	MF-702; MF-706
Y/DZ–					
1113/R1	20:1338	OSTI; NTIS; GPO Dep.	E 1.99:	DE95001699	MF-701
Y/EN–					
4688	20:544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001694	MF-700
Y/ER–					
105/V1-D2/A1	20:242	*See* DOE/OR–01-1161/V1-D2/A1			
158	20:444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001769	MF-2050
172/V2-D1	20:494	*See* DOE/OR–01-1268/V2-D1			
182/V2-D1	20:495	*See* DOE/OR–01-1273/V2-D1			
Y/SUB–					
94-99069C/Y15/10	20:545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001696	MF-702
94-99069C/Y15/9	20:478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001689	MF-703
Y/TS–					
1015/R2	20:546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001692	MF-702

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
1228	20:939	OSTI; NTIS; GPO Dep.	E 1.99:	DE95002054	MF-702
806/R3	20:445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002063	MF-702
838/R3	20:446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95002065	MF-702
YJT–					
94-10	20:1861	OSTI; NTIS; INIS		DE95606028	
Z–					
332	20:1166	OSTI; NTIS		DE95001723	
333	20:1167	OSTI; NTIS		DE95001724	
334	20:627	OSTI; NTIS		DE95001717	
336	20:1035	*See* CONF-930802–17			
337	20:1105	*See* CONF-930802–22			
338	20:1104	*See* CONF-930802–21			
339	20:1371	*See* CONF-930802–18			
340	20:1776	*See* CONF-9205419–1			
342	20:1775	*See* CONF-9108101–4			
343	20:1372	*See* CONF-9309146–10			
345	20:1054	OSTI; NTIS; INIS		DE95001718	
347	20:626	*See* TVA/NFERC–93/8			
348	20:1055	OSTI; NTIS		DE95001737	
352	20:695	*See* CONF-921104–16			
353	20:1777	*See* CONF-9303310–1			
357	20:1704	*See* CONF-9311249–1			

Order Number Correlation

The correlation list is provided for those organizations that file documents by report number but may receive requests by order number. For more information about a document, refer to the Report Number Index.

Order No.	*Report No.*
DE93000299	CONF-9306148–49
DE94000210	NREL/TP–451-7166
DE94000286	NREL/SP–463-6156
DE94005434	DOE/FTR–94005434
DE94008306	DOE/FTR–94008306
DE94008730	DOE/FTR–94008730
DE94010252	DOE/ER/61447–1
DE94010792	RFP-ADD–0030
DE94011553	DOE/NE/32112–T6
DE94011634	DOE/ER/53243–6
DE94011838	NREL/TP–451-6638
DE94011859	NREL/TP–473-7260
DE94011886	NREL/TP–451-7162
DE94011891	NREL/CP–433-7265
DE94011899	NREL/TP–411-7170
DE94012267	DOE/MC/23166–3833
DE94012287	DOE/MC/30012–3861
DE94012293	DOE/MC/29061–3868
DE94012294	DOE/MC/23166–3869
DE94012298	DOE/MC/27423–3874
DE94012299	DOE/MC/27423–3875
DE94012300	IS-M–804
DE94012482	DOE/ER/40723–2
DE94012558	DOE/PC/92521–T131
DE94012578	DOE/PC/92521–T151
DE94012615	DOE/PC/91308–10
DE94012845	DOE/ER/40561–130
DE94012847	DOE/ER/40561–133
DE94012853	DOE/ER/40561–141
DE94012854	DOE/ER/40561–142
DE94013524	DOE/ER/40200–323
DE94014070	DOE/ER/02504–391
DE94014443	LA-UR–94-1938
DE94014597	DOE/ER/60773–4
DE94014728	UCRL-JC–115809
DE94015028	ANL/ET/CP–83313
DE94015373	SR/H–751
DE94015449	HAN–93855-Rpt.7-Del.
DE94015594	ANL/EAD/LD–2
DE94015607	CONF-8512135–Summ.
DE94015657	DOE/ER/60631–13
DE94015659	DOE/ER/60631–14
DE94015701	SR/H–755
DE94015702	SR/H–756
DE94015704	SR/H–758
DE94015785	SAND–94-1881C
DE94015787	LA-UR–94-2082
DE94016508	BNWL-CC–979
DE94016755	HW-SA–2984
DE94016896	ANL/RE/PP–79448
DE94016941	BNWL-CC–1378
DE94016968	UCRL-JC–115131
DE94017205	DOE/EIS–0194-MAP
DE94017403	SAND–94-2144C
DE94017416	WHC-SA–1455
DE94017418	SAND–94-2156C
DE94017447	HW–68474
DE94017456	PNL-SA–24404
DE94017460	PNL-SA–23850
DE94017642	DPW–56-394
DE94017646	DPW–56-371
DE94017684	SAND–94-8245
DE94017694	CONF-9404137–
DE94017705	CONF-940225–121
DE94017749	CONF-9405109–11
DE94017755	CONF-940571–2
DE94017769	CONF-940135–9
DE94017795	PNL-SA–23466
DE94017799	PNL-SA–23112
DE94017861	CONF-950130–1
DE94017866	CONF-940225–123
DE94017872	CONF-940406–16
DE94017876	CONF-950104–1
DE94017902	CONF-9410186–1
DE94017940	DOE/ID/12847–7
DE94017948	DOE/AL/73394–T1-Exec.Summ.
DE94017950	DOE/AL/73394–T1-Pt.2
DE94017954	ANL–94/19
DE94017987	RFP–4834
DE94017995	WHC-SA–2559
DE94018087	LA-UR–94-2701
DE94018113	DOE/OR/21400–94/C0354
DE94018118	CONF-9407126–1
DE94018150	WHC-SA–2235
DE94018151	WHC-SD-WM-TI–607
DE94018194	LBL–34458
DE94018196	LBL–34716
DE94018249	HW–68934
DE94018261	LA-UR–94-2739
DE94018264	LA-UR–94-2736
DE94018293	LA-UR–94-2845
DE94018299	LA-UR–94-2871
DE94018318	LA-UR–94-2891
DE94018327	UCRL-JC–117820
DE94018369	ANL/TD/CP–83926
DE94018370	ANL/TD/CP–83927
DE94018441	WHC-SD-WM-DA–163
DE94018446	PPPL-CFP–3140
DE94018460	DOE/AL/62350–113
DE94018462	DOE/AL/62350–138
DE94018463	DOE/AL/62350–139
DE94018464	DOE/AL/62350–120
DE94018466	DOE/AL/62350–43-Rev.1
DE94018467	WHC-SD-WM-ANAL–034-Vol.1
DE94018468	WHC-SD-WM-ANAL–034-Vol.2
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DE94018746	K/HWP–26
DE94018747	SAND–94-1508
DE94018896	SAND–94-1181C
DE94018901	SAND–94-1302C
DE94019072	DOE/EW/50625–T18-Vol.1
DE94019073	DOE/EW/50625–T18-Vol.2
DE94019074	DOE/EW/50625–T18-Vol.3
DE94019147	CONF-941017–2
DE94019240	CONF-9405206–
DE94019249	ORNL/ER/Sub–87-99053/73
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DE95000101	DOE/MT/92012–7
DE95000102	DOE/BC/14862–6
DE95000103	DOE/BC/14431–1-Vol.1
DE95000105	DOE/BC/14431–1-Vol.5
DE95000106	DOE/BC/14431–1-Vol.4
DE95000107	DOE/BC/14431–1-Vol.3
DE95000108	DOE/BC/14431–1-App.
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DE95000111	DOE/BC/14653–3
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DE95000859	LA-UR–94-3139
DE95000860	LA-UR–94-3138
DE95000862	LA-UR–94-3132
DE95000863	LA-UR–94-3124
DE95000911	LA-UR–94-3196
DE95000915	LA-UR–94-3184
DE95000916	LA-UR–94-3181

Order No.	Report No.
DE95000919	LA-UR-94-3171
DE95000920	LA-UR-94-3170
DE95000921	LA-UR-94-3167
DE95000923	LA-UR-94-3165
DE95000933	LA-UR-94-3210
DE95000934	LA-UR-94-3213
DE95000935	LA-UR-94-3221
DE95000939	LA-UR-94-3244
DE95000978	PNL-10094
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DE95001016	LA-UR-94-3331
DE95001017	LA-UR-94-3344
DE95001018	LA-UR-94-3351
DE95001019	LA-UR-94-3362
DE95001020	LA-UR-94-3359
DE95001021	LA-UR-94-3160
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DE95001068	DOE/AN/ACNT-94C
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DE95001070	CONF-9409227-1
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DE95001102	ANL/ES/CP-82395
DE95001119	ANL/ES/CP-82394
DE95001126	ANL/ER/CP-82594
DE95001143	WSRC-RP-93-67-4-Vol.1
DE95001144	WSRC-RP-93-67-4-Vol.2
DE95001145	WSRC-RP-93-67-4-Vol.3
DE95001150	DOE/CE/15557-T4
DE95001203	DOE/ER/60886-T3
DE95001204	DOE/ER/14145-T3
DE95001205	DOE/PC/88819-T8
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DE95001245	WSRC-IM-94-42
DE95001246	WSRC-3Q1-2-Vol.1-Rev.3
DE95001249	WHC-SP-1096
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DE95001292	CONF-940442-
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DE95001296	WHC-EP-0460
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DE95001316	WHC-SP-1109
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DE95001326	DOE/ER/60845-4
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DE95001333	BNWL-SA-3583
DE95001337	BNWL-SA-3047
DE95001338	HW-69000-V2A
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DE95001347	CONF-9410176-1
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DE95001349	CONF-9411138-1
DE95001350	CONF-9411137-1
DE95001351	CONF-940411-55
DE95001352	CONF-941102-29
DE95001357	CONF-9410165-8
DE95001358	CONF-940704-4
DE95001373	WHC-SD-WM-ATP-082
DE95001374	WHC-SD-WM-EV-060-Rev.4
DE95001375	WHC-SD-WM-DTR-036
DE95001377	WHC-SD-WM-TI-664
DE95001378	WHC-SD-WM-RPT-093
DE95001384	ES/ER/TM-120/V1
DE95001385	ES/ER/TM-120/V2
DE95001387	DOE/ER/25027-8
DE95001389	GA-A-21778
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DE95001392	LA-SUB-94-143
DE95001401	LA-SUB-94-141
DE95001404	WHC-SD-WM-TI-399-Rev.2
DE95001407	WHC-SD-WM-ER-364
DE95001408	WHC-SD-WM-TI-643
DE95001411	WHC-SD-WM-PMP-014
DE95001416	SAND-94-1498
DE95001417	SAND-94-1710
DE95001419	CONF-9310209-2
DE95001422	CONF-940671-1
DE95001425	CONF-9405187-3
DE95001427	CONF-9408170-2
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DE95001431	PNL-SA-23687
DE95001432	DOE/MC/26026-3902
DE95001433	LA-12792-PR
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DE95001435	WHC-SD-WM-PRS-014
DE95001436	WHC-SD-W236A-ER-011
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DE95001438	WAPD-RC/E(EE)-3300
DE95001439	DOE/NV/10162-21
DE95001444	ANL/EA/CP-84264
DE95001445	ANL/TD/CP-82768
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DE95001450	ANL/MCS/PP-72994
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DE95001456	ANL/MCS/PP-71694
DE95001457	ANL/IPNS/PP-79589
DE95001461	DOE-STD-1082-94
DE95001462	PNL-9424
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DE95001466	WSRC-TR-94-0246
DE95001468	WHC-SD-WM-ER-363
DE95001470	ANL/ET/CP-82340
DE95001471	ANL-HEP-TR-94-57
DE95001472	ANL/MCS/CP-84282
DE95001473	WSRC-TR-94-0425
DE95001476	WSRC-TR-93-762
DE95001477	DOE/MC/30127-3917
DE95001478	DOE/MC/30098-3915
DE95001479	DOE/MC/29113-3912
DE95001482	DOE/MC/24257-3896
DE95001483	PNL-9000-Pt.4
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DE95001486	DOE/ET/34013-15
DE95001489	SLAC-PUB-6535
DE95001492	DOE/SF/18852-T44
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DE95001497	KCP-613-5388
DE95001498	KCP-613-5425
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DE95001504	UCRL-JC-116930
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DE95001508	SAND-94-0146
DE95001509	POEF-T-3636
DE95001510	POEF-SH-19
DE95001511	WHC-SD-WM-ES-300
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DE95001515	WHC-SD-WM-WP-132-Rev.4
DE95001516	WHC-SD-W049H-ATP-001
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DE95001538	WHC-SD-GN-TRP-30018
DE95001548	DOE/ER/14185-T1
DE95001553	DOE/AL/43771-T4
DE95001554	WHC-EP-0694
DE95001555	DOE/EIA-0380(94/10)
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DE95001557	WHC-SD-SNF-ER-003
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DE95001584	TVA/NFERC-94/1
DE95001585	TVA/NFERC-93/6
DE95001586	TVA/NFERC-93/7
DE95001587	TVA/NFERC-93/4
DE95001593	WHC-SD-W026-OCD-001
DE95001596	WHC-SD-PRP-HA-010
DE95001597	WHC-SD-SNF-TC-001
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DE95001605	SAND-94-0805C
DE95001606	SAND-94-2376C
DE95001607	SAND-94-2349C
DE95001608	SAND-93-4074C
DE95001612	SAND-94-1859C
DE95001617	SAND-94-2354C
DE95001618	SAND-94-2380C
DE95001620	SAND-94-1071C
DE95001621	SAND-94-1817C
DE95001622	SAND-94-1758C
DE95001623	SAND-94-2431C
DE95001624	SAND-94-2432C
DE95001625	SAND-94-1940C
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DE95001631	WHC-SD-WM-PE-053
DE95001635	WHC-SD-CP-TI-193
DE95001636	WHC-SD-WM-SDD-025

Order No.	Report No.
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DE95001638	WHC-SD-WM-TI–648
DE95001640	WHC-SA–2664
DE95001641	WHC-SA–1884
DE95001642	WHC-SA–1937
DE95001643	WHC-SA–2302
DE95001644	WHC-SD-SQA-CSA–20374
DE95001649	WHC-SD-SNF-LB–001
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DE95001651	ORNL/TM–12753
DE95001652	ORNL/CON–362
DE95001653	IS-T–1713
DE95001654	IS-T–1689
DE95001656	IS-T–1698
DE95001658	PNL–10128
DE95001659	PNL–10101
DE95001660	PNL–10099
DE95001661	PNL–10127
DE95001662	DOE/EIA–0538(94/95-2)
DE95001663	IS-T–1712
DE95001664	IS-T–1538
DE95001665	IS-M–798
DE95001669	DPW–53-1413
DE95001670	DPW–53-1402-Del.Ver.
DE95001672	IS-T–1710
DE95001673	IS-T–1696
DE95001675	IS-T–1699
DE95001676	IS-T–1701
DE95001677	IS-T–1621
DE95001678	IS-M–806
DE95001679	IS-M–799
DE95001680	IS-M–796
DE95001681	IS-M–795
DE95001682	IS-M–797
DE95001684	IS-M–803
DE95001687	IS-T–1709
DE95001689	Y/SUB–94-99069C/Y15/9
DE95001690	RFP–4883
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DE95001693	Y–2465-3-Draft
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DE95001695	Y/DQ–51
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DE95001697	DOE/OR–01-1268/V1-D1
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DE95001699	Y/DZ–1113/R1
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DE95001703	DOE/BC/14856–T1
DE95001704	DOE/ER/45252–T6
DE95001707	SLAC-PUB–6690
DE95001711	DOE/EE–0026
DE95001714	CONF-930802–21
DE95001715	CONF-930802–22
DE95001716	CONF-930802–17
DE95001717	Z–334
DE95001718	Z–345
DE95001719	TVA/NFERC–93/8
DE95001723	Z–332
DE95001724	Z–333
DE95001725	CONF-930802–18
DE95001726	CONF-9308250–1
DE95001729	CONF-921104–16
DE95001730	CONF-9303310–1
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DE95001734	CONF-9205419–1
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DE95001737	Z–348
DE95001739	ORNL/TM–12819
DE95001740	DOE/HR–0112
DE95001742	LA-SUB–94-148
DE95001743	LA-SUB–94-163
DE95001744	LA-SUB–94-131
DE95001745	LA-SUB–94-132
DE95001746	LA-SUB–94-137
DE95001747	LA-SUB–94-142
DE95001748	LA-SUB–94-140
DE95001749	LA-SUB–94-139
DE95001752	LA-SUB–94-159
DE95001753	LA-SUB–94-153
DE95001754	LA-SUB–94-149
DE95001755	LA–12835-C
DE95001756	DOE/MC/30040–94/C0380
DE95001757	DOE/MC/28016–94/C0378
DE95001758	DOE/MC/29261–94/C0377
DE95001759	DOE/EA–0820
DE95001760	DOE/EA–0918
DE95001761	DOE/EA–0995
DE95001762	DOE/CE/15553–T6
DE95001763	DOE/ER/12108–T1
DE95001764	DOE/ER/40505–T1
DE95001765	DOE/ER/14083–2
DE95001766	DOE/EIS–0207
DE95001768	DOE/EA–0941
DE95001769	Y/ER–158
DE95001770	ORNL/TM–12807
DE95001771	ORNL/TM–12671
DE95001772	DOE/OR–01-1311-D1
DE95001773	PATENTS-US–A7953042
DE95001774	PATENTS-US–A7952931
DE95001775	PATENTS-US–A7952439
DE95001776	PATENTS-US–A7952247
DE95001778	PATENTS-US–A7950552
DE95001779	PATENTS-US–A7950548
DE95001780	PATENTS-US–A7946733
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DE95001795	SAND–94-1743
DE95001796	SAND–94-2143
DE95001798	DOE/ER/61030–T1
DE95001800	DOE/ER/40344–8
DE95001802	DOE/ER/45283–8
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DE95001807	DOE/ER/13519–8
DE95001808	DOE/ER/14114–4
DE95001809	WSRC-TR–94-0449
DE95001811	DOE/CE/15479–T6
DE95001812	DOE/ER/40439–T2
DE95001813	DOE/ER/45085–T2
DE95001814	DOE/ID/13040–T25
DE95001815	DOE/EP/10050–T1
DE95001816	DOE/EP/10050–T2
DE95001817	DOE/ER/54186–T2
DE95001818	DOE/ER/54186–T3
DE95001819	DOE/ER/54186–T4
DE95001820	DOE/ER/54186–T5
DE95001821	WHC-SP–1126-Vol.1
DE95001823	WHC-SP–1126-Vol.3
DE95001825	ORNL–6807
DE95001826	ORNL/TM–12754
DE95001827	SAND–94-1280C
DE95001828	SAND–94-2437C
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DE95001837	UCRL-JC–115854
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DE95001845	ANL/MCS/CP–84283
DE95001846	WHC-EP–0782-Vol.1
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DE95001848	SLAC-PUB–6586
DE95001849	SLAC-PUB–6677
DE95001850	SLAC-PUB–6686
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DE95001852	DOE/RL–94-113
DE95001853	PNL–10114
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DE95001855	PNL–10182
DE95001856	SAND–94-0278
DE95001857	SAND–94-1819
DE95001858	SAND–94-2361
DE95001859	SAND–94-2572
DE95001861	DOE/ER/40561–137
DE95001862	DOE/MC/25185–3301
DE95001863	ORNL/TM–12701
DE95001867	DOE/ER/45330–T1
DE95001870	ES/ER/TM–58
DE95001871	ORNL/TM–12741
DE95001872	DOE/EIA–0538(94/95-3)
DE95001873	ORNL/CDIAC–55
DE95001874	LA–12846-MS
DE95001875	RFP–4873
DE95001876	KCP–613-5432
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DE95001881	SAND–94-1606C
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DE95001899	WHC-SD-WM-ER–324
DE95001900	WHC-SD-WM-ER–311
DE95001901	WHC-SD-WM-ER–312
DE95001902	EGG-M–94237
DE95001903	EGG-NRE–11406
DE95001904	EGG-WTD–11156
DE95001905	EGG-WM–11342
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DE95001908	EGG-PIR–10633(2Q-94)
DE95001909	EGG-EST–9222-Vol.1
DE95001910	DOE/ER/61640–T1
DE95001911	DOE/LLW–103-Rev.1
DE95001912	DOE/ID–22114
DE95001914	DOE/ID–22112
DE95001915	DOE/ID–22110
DE95001916	EGG-WTD–11136
DE95001917	INEL/MISC–94045
DE95001918	INEL/MISC–94046
DE95001919	SAND–94-1826
DE95001920	INEL/MISC–94047
DE95001921	EGG-WM–11479
DE95001922	PNL–10158
DE95001923	PNL–10150
DE95001924	PNL–9990
DE95001925	EGG-EP–11237-Qtr1
DE95001926	EGG-WTD–10651
DE95001927	DOE/LLW–139
DE95001928	PPPL–2975
DE95001929	PPPL–3010
DE95001930	PPPL–3016

Order No.	Report No.
DE95001935	DOE/PC/89653–T15
DE95001936	DOE/PC/89653–T16
DE95001937	DOE/PC/90057–T3
DE95001938	DOE/PC/90057–T4
DE95001939	DOE/PC/90057–T5
DE95001940	DOE/PC/90057–T6
DE95001941	DOE/PC/90057–T7
DE95001942	DOE/PC/90057–T8
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DE95604093	INIS-mf–13988
DE95604094	INIS-mf–13989

Order No.	Report No.
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DE95604166	INIS-mf–14366
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DE95604192	INIS-BR–3429
DE95604193	INIS-BR–3430
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DE95605205	IAEA-INFCIRC–438
DE95605206	IAEA-INFCIRC–440
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DE95605213	IAEA-NDS–7(rev.94/3)
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DE95605252	JINR-E–2-94-174
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DE95605280	JINR-R–4-94-115
DE95605286	JINR-E–2-94-132
DE95605306	JINR-E–2-94-170
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DE95605315	JINR-E–2-94-162
DE95605322	JINR-E–2-94-88
DE95605323	JINR-E–2-94-89
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DE95605342	JINR-E–2-94-127
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DE95605345	JINR-R–4-94-129
DE95605347	JINR-R–1-94-98
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DE95605354	JINR-E–1-94-155
DE95605355	JINR-E–1-94-156
DE95605357	JINR-E–7-94-136
DE95605358	JINR-R–7-94-134
DE95605393	JINR-E–4-94-141
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DE95606172	AAEC/E–242
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DE95606543	CEA-CONF–11831
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Order No.	Report No.
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DE95606978	AREAEE–313
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DE95607004	IC–94/158
DE95607005	IC–94/165
DE95607006	IC–94/171
DE95607007	IC–94/189
DE95607008	IC–94/192
DE95607009	IC–94/204
DE95607010	IC–94/53
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DE95607014	IPNO-TH–93-63
DE95607015	IPNO-TH–93-71
DE95607016	IPNO-TH–93-74
DE95607017	IPNO-TH–94-14
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DE95607019	UM-P–93/46
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DE95607021	UM-P–93/53
DE95607022	UM-P–93/61
DE95607043	IC–94/161
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DE95607045	IC–94/184
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DE95607079	IC–94/146
DE95607080	IC–94/147
DE95607081	IC–94/156
DE95607082	IC–94/168
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DE95607084	IC–94/179
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DE95607087	IC–94/207
DE95607088	IC–94/216
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DE95607095	UM-P–93/38
DE95607096	UM-P–93/44
DE95607097	UM-P–93/45
DE95607099	UM-P–93/63
DE95607100	UM-P–93/65
DE95607101	UM-P–93/71
DE95607102	UM-P–93/72
DE95607110	CEA-DAPNIA-SPP–93-22
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DE95607114	LAPP-L–448/93
DE95607115	LAPP–440-93
DE95607120	LAPP-A–427-93
DE95607121	IC–94/155
DE95607124	IC–94/202
DE95607125	IPNO-TH–93-25
DE95607129	UM-P–93/54
DE95607132	IPNO-TH–93-41
DE95607133	ITF–93-38
DE95607138	IPNO-TH–93-37
DE95607139	IPNO-TH–93-68
DE95607143	IC–94/119
DE95607144	IC–94/169
DE95607145	IC–94/191
DE95607146	IC–94/64
DE95607156	IPNO-TH–92-109
DE95607157	LAL–93-38
DE95607159	UM-P–93/51
DE95607173	IC–94/154
DE95607177	IC–94/203
DE95607178	IPNO-TH–93-31
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DE95607181	IC–93/216
DE95607182	IPNO-TH–93-47
DE95607184	IPNO-DRE–94-10
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DE95607189	LAPP-EXP–94-03
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DE95607192	IPNO-TH–94-08
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DE95607194	UM-P–93/42
DE95607199	IPNO-TH–91-9I
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DE95607201	IC–94/163
DE95607202	LAPP-A–450/93
DE95607210	IPNO-TH–93-17
DE95607211	IPNO-TH–93-38
DE95607216	IPNO-DRE–93-22
DE95607217	IPNO-DRE–93-23
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DE95607368	GANIL-T–93-04
DE95607370	ITF–94-3
DE95607371	ITP–93-23
DE95607388	UM-P–93/66
DE95607390	IPNO-DRE–93-17
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DE95607430	IPNO-DRE–93-33
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DE95607521	IC–94/177
DE95607536	AREAEE–292
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DE95607538	JINR-R–4-94-146
DE95607577	IC–94/148
DE95607590	TRITA-ALP–94-3
DE95607591	TRITA-ALP–94-4
DE95607598	IC–94/142
DE95607599	IC–94/200
DE95607603	TRITA-ALP–94-2
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DE95607612	ITP–94-9
DE95607623	AREAEE–289
DE95607624	AREAEE–297
DE95607626	IC–94/134
DE95607629	UM-P–93/04
DE95607642	CEA-N–2739
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DE95607649	LRP–497/94
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DE95607663	IC–94/145
DE95607664	IC–94/190
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DE95607769	UM-P–93/73
DE95607772	IPNO-DRE–93-25
DE95607773	UM-P–92/77
DE95607804	IC–94/139
DE95607805	IC–94/183
DE95607806	IPNO-TH–93-24
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DE95607820	IC–94/159
DE95607840	IC–94/129
DE95607841	IC–94/160
DE95607844	IC–94/151
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DE95707349	NEI-DK–1644
DE95707361	NEI-DK–1668
DE95707362	DTH-LBM-TR–94-297
DE95707364	NEI-DK–1671
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Order No.	Report No.
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DE95709764	JAERI-M-94-038
DE95709882	JAERI-Conf-94-003
DE95709883	RERF-R-1-93
DE95709888	JAERI-Tech-94-010
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DE95709890	JAERI-Tech-94-004
DE95709891	JAERI-Tech-94-005
DE95709892	JAERI-Data/Code-94-006
DE95709893	JAERI-Research-94-006
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DE95711146	GSI-94-53(prepr.)
DE95711147	GSI-94-54(prepr.)
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DE95711199	Juel-2922
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DE95711699	Juel-2837
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DE95711703	GSI-94-04
DE95711707	IKE-4-137
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DE95714833	NEDO-P-9453
DE95714834	NEDO-P-9451
DE95714835	NEDO-C-9316
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DE95715033	FZR-50(prepr.)
DE95715035	FZR-53
DE95715037	DESY-94-137
DE95715038	DESY-94-145
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DE95715044	GSI-94-58(prepr.)
DE95715045	GSI-94-59(prepr.)
DE95715046	GSI-94-60(prepr.)
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DE95715074	INIS-mf-15058
DE95715075	INIS-mf-15055
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DE95715135	DESY-94-116
DE95715136	DESY-94-119
DE95715137	DESY-94-103
DE95715139	INIS-mf-15054
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DE95715240	GKSS-94/E/9
DE95715241	DESY-94-117
DE95715282	GSI-94-52(prepr.)
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DE95715501	KFK-5361
DE95715502	Juel-2872
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DE95715733	Juel-2907
DE95715735	GSI-94-46(prepr.)
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TI94012360	OCDO-94012360
TI94017661	CONF-940724-1
TI94017960	NUREG-1484-Vol.1
TI94017961	NUREG-1484-Vol.2
TI94017979	NUREG/CR-6203
TI94018691	NRRI-94-13
TI95000779	DOE/HR-0096
TI95001364	NUREG/CR-6146
TI95001460	NUREG/CR-6105
TI95001501	NUREG/CR-6228

Order No.	*Report No.*
TI95001502	NUREG–1494
TI95001503	NUREG/CR–6166
TI95001712	DOE/RW–0450
TI95001878	NUREG–0750-Vol.39-Index-2
TI95001892	NUREG/CR–5591-Vol.2-No.2
TI95002162	NUREG–0750-Vol.40-No.2
TI95002268	NUREG/CR–6161
TI95002269	NUREG/CR–6087
TI95002270	NUREG/CR–5535-Vol.6
TI95002934	NUREG/CR–5403
TI95002937	NUREG/CP–0138
TI95002938	NUREG/CR–4674-Vol.19
TI95002939	NUREG/CR–4674-Vol.20
TI95003004	NUREG/CR–6281
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US United States
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VC Saint Vincent and the Grenadines
VE Venezuela
VN Viet Nam
VU Vanuatu

WS Samoa

YE Yemen, Republic of
YU Yugoslavia

ZA South Africa
ZM Zambia
ZR Zaire
ZW Zimbabwe

Codes for International Organizations

ED EANDC [European American Nuclear Data Committee]
EP European Patent Office
IO ILO [International Labor Organization]
IX IUPAC [International Union of Pure and Applied Chemistry]
QS INSPEC [Information Service in Physics, Electrotechnology and Control]
QZ INPADOC [International Patent Document Centre]
WO WIPO [World Intellectual Property Organization]
XA IAEA [International Atomic Energy Agency]
XC CERN [European Organization for Nuclear Research]
XD OECD [Organization for Economic Co-Operation and Development]
XE CEC [Commission of the European Communities]
XF FAO [Food and Agricultural Organization of the United Nations]
XH AAEA [Arab Atomic Energy Agency]
XI IIASA [International Institute for Applied Systems Analysis]
XJ JINR [Joint Institute for Nuclear Research]
XK WMO [World Meteorological Organization]
XN NEA [Nuclear Energy Agency of the OECD]
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XR ICRP [International Commission on Radiological Protection]
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Order Number Correlation	Report Number Index	Contract Number Index	Subject Index	Personal Author Index	Corporate Author Index